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MISCELLANEOUS.

General.

427. SALISBURY, E. J. 58.006
Kew in war and peace.
Agriculture, 1944, **50**: 559-61.
The significance of the Royal Botanic Gardens at Kew to horticulture and agriculture is briefly described.

428. RUSSELL, E. J. 63(072)
Science and crop growth.
Agriculture, 1944, **51**: 1-4.
The relations between pure and applied science in agriculture are discussed and a reduction of the time lag between a scientific discovery and its practical application, which may now be 20 years, is described as one of the major problems.

429. WARDLAW, C. W. 58
Unification of botanical science.
Nature, 1944, **153**: 125-30.
That the study of botany is suffering from an inevitable and progressive increase in specialization is the theme of this essay. "A case is made out for the view that the over-emphasis of any single aspect, while the whole is not kept in proper perspective, will almost certainly lead to the fabrication of unstable theoretical superstructures destined to crumble because they have not been based on the fundamental reality of organic wholeness." The author offers no solution, but points out that similar feelings to his own seem to underly the numerous symposia, joint-meetings and conferences that are from time to time convened. A definite policy should be framed, and the time for doing so is at hand.

430. (BRITISH ECOLOGICAL SOCIETY AND ROYAL ENTOMOLOGICAL SOCIETY.) 595.7: 581.14
The inter-relations of plants and insects; the place of both in the eco-system.
Nature, 1944, **153**: 424-6.
A summary of a discussion held in London on 12 November, 1943.

431. WALTER, H. 581.5
Ökologische Pflanzengeographie. **(Ecological plant geography.)**
Fortschr. Bot., 1940, **9**: 264-90, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 3-4.
This review of the literature on ecological plant geography up to 1939 is of interest also to the horticulturist, such subjects as the light factor, soil suction, water balance, uptake of mineral salts and composition of the cell sap being dealt with. The existence of a monograph on *Calluna* by Beijerinck is noted.

432. RAMAN, P. K. 632.183
Preliminary studies on the wind-break effect of crops.
Indian J. agric. Sci., 1943, **13**: 273-8, bibl. 6.
The paper describes the hot wire anemometer, records wind velocities under a variety of conditions and discusses the effect of high winds and heavy rains.

433. TRUCCO, S. E. 519
De la correlacion y sus aplicaciones. **(Theory of correlation and its application.)** [English summary 5 ll.]
Rev. Fac. Agron. B. Aires, 1943, **10**: 237-62, bibl. 13.
The theory of the interdependence between the variations of two variables is developed, making evident the influence which the result of the deviations has in the calculus of the coefficient of lineal correlation. The norms for the calculus and interpretation of the coefficient of correlation are given, as well as its application to the statistical series. [Author's summary.]

434. CHAIN, E., AND FLOREY, H. W. 633.88
Penicillin.
Endeavour, 1944, **3**: 3-14, bibl. 53.
An authoritative account of the mould product penicillin, its preparation, uses and limitations. The authors are responsible for much of the recent successful work on this valuable chemotherapeutic agent.

435. Erenburg, P. M. 631.586
How to bring arid regions under cultivation.
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad V.R. Viljjamas, 1940, No. 11-12, pp. 25-8.

A method whereby it is possible to grow vegetables and fruit in the southern part of the Aktjubinsk region and other dry parts is described. It can be applied where the ground water is about 1 to 1·5 m. below the surface of the soil in the spring. In order to bring the plant roots within reach of the water, trenches are dug down to the depth where it lies, and the top soil is thrown back. The sand and other intervening layers of earth are piled between the trenches, affording them protection. The trenches should be dug transversely to the direction of the prevailing wind, and should be 1·25 to 1·5 m. wide. The only maintenance they require is to keep the sloping sides from sliding down, and to clear out any sand which may have been blown in. Even where the rainfall is 150 mm. or less, vegetables can be grown there without irrigation, the only additional water necessary being that required when planting out. The yields of potatoes grown in this way have amounted to 500 centners per hectare, and of tomatoes 1,500 centners. Both cabbages and cucumbers which grow poorly even when irrigated, gave good yields when grown in trenches. Bush fruit and vines can also be grown in them; and fruit trees can be planted in pits instead of trenches.

Physiology.

436. Maximov, N. A. 581.1(47)
Twenty-five years' progress of plant physiology in the Soviet Union. [Russian.*]
Sovetsk. Botan., 1943, No. 1, pp. 3-14.

A general review confined to Soviet work, the main heads being:—phasic development, hormones, frost resistance, drought resistance and irrigation problems, assimilation, mineral nutrition, metabolism and enzyme action, and respiration. Among the points of particular interest are: the application of Krenke's "theory of age cycles" (alternate senescence and rejuvenation of the plant tissues) to prediction of the earliness of hybrid seedlings of fruit trees; the work of A. S. Serejskij on the induction of parthenocarpy in *Cucurbitaceae* by growth substances; the use of suction pressure measurements on cotton to indicate the most suitable times for irrigation; the use by A. A. Richter of the antagonism of divalent ions to combat the effects of soil salinity; S. V. Tugeeva's observations that the effect of water shortage in reducing yield of wheat was due, not to a reduced rate of photosynthesis, but to reduced growth in leaf area; and the theory of A. I. Oparin that the synthetic or hydrolytic activity of an enzyme is determined by whether or not it is adsorbed on hydrophobic colloids. D.W.G.

437. Jensen, C. 612.014.44: 631.531
Über die Möglichkeit, mit Hilfe von Lichtbehandlung, die Keimfähigkeit von Samen zu verlängern. **(Prolonging the viability of seeds by means of light treatment.)**
Z. Bot., 1942, **37**: 487-99, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 77-8.

The paper is a report on the first 10-year period of a long-term experiment. In spring 1933 cauliflower and cabbage seeds were exposed to the light of a mercury and a sollux lamp, singly and both lamps combined, and care was taken that the whole surface of the seed was exposed to the rays. The seed was then stored under various conditions together with untreated seed and germination tests were made in subsequent years. Viability was equal during the first 3 years, it declined in cauliflower to 60% after 8 years with untreated seed as against 85% with treated seed. The corresponding figures for cabbage were 77% as against 93-94%. The most favourable treatment was an exposure to the combined light of both lamps for one hour.

* Full translation available on loan at Bureau.

438. Harder, R., v. Witsch, H., and Bode, O. 612.014.44: 581.145.1
Über Erzeugung einseitig und allseitig verlaubter Inflorescenzen durch photoperiodische Behandlung von Laubblättern. (Untersuchungen an *Kalanchoë Blossfeldiana.*) **(The induction of foliage leaf-development on inflorescences by means of photoperiodic treatment of foliage leaves. Investigations on kalanchoe.)**
Jb. Bot., 1942, **90**, 546-91, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 79.

The following two problems are dealt with:—(1) The formation of inflorescences as dependent on the supply of flowering hormones produced in the leaves. (2) The conduction of the flowering hormone.

439. Alsac, N. 581.45
Untersuchungen über die Beziehung anatomischer und morphologischer Eigenschaften des Blattes zu seinem Wärmehaushalt. **(The relation of anatomical and morphological properties of the leaf to its thermal balance.)**
Bot. Zbl., 1942, Vol. **61**, *Beibl.* **A**, pp. 329-68, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 110.

Measurements with thermo needles in the laboratory showed that the temperature of leaves of succulents in white light rises more slowly than that of non-succulents, but that the former store the absorbed heat for a longer time. Anthocyanin and chlorophyll promote a rise in temperature, which is, however, too small to be of any ecological significance. Infra-red rays are better utilized by leaves of succulents than by those of non-succulents. The temperature of anthocyanin-containing cell layers rises from infra-red rays only. Hairiness varies in its effects on the internal temperature of tissues with colour and density. Wind reduces both the internal leaf temperature and the difference in the temperatures of different leaf types. In open air experiments the results of a previous worker were confirmed who found that in full sunlight transpiration does not function as a cooling factor.

440. Kuhn, E. 581.4: 631.541
Untersuchungen zur Frage einer hormonalen oder cellulären Geschlechtsdifferenzierung bei Blütenpflanzen. **(Hormonal or cellular sex differentiation in flowering plants.)**
Planta, 1941, **32**: 286-342, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 77.

The question is examined whether in graft unions of dioecious plants the sex of one partner can be influenced by the other. Careful experiments showed that no such influence exists and it is concluded that sex differentiation is not due to hormones but to an intracellular process. The test plants were *Mercurialis annua* and *Cannabis sativa.*

441. Györffy, B. 581.11
Untersuchungen über den osmotischen Wert polyploider Pflanzen. **(The osmotic value of polyploid plants.)**
Planta, 1941, **32**: 15-37, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 4-5.

Extensive comparisons of osmotic values in a number of plants, among them *Lycopersicum esculentum* and *Capsicum annuum*, carried out at the Kaiser Wilhelm Institut für Biologie, Berlin-Dahlem, showed that in the majority of cases (more than 1,000 determinations) the osmotic value in tetraploids was slightly lower than that in diploids; but in old plants and under extreme conditions the results were reversed. It is concluded that polyploids are more variable also in respect of their osmotic values and therefore more adaptable. Under dry conditions and in grafts an advantageous increase of the osmotic value in tetraploids beyond the 2n-level was observed. Tetraploids were more resistant to dry climate than diploids.

442. ROSENE, H. F. 581.11
Quantitative measurement of the velocity of water absorption in individual root hairs by a microtechnique.
Plant Physiol., 1943, **18**: 588-607, bibl. 17.
The data furnish strong evidence for unequal absorption in different areas of a single hair-bearing epidermal cell under the particular conditions described. [From author's summary.]

443. HAYWARD, H. E., AND SPURR, W. B. 581.11
Effects of osmotic concentration of substrate on the entry of water into corn roots.
Bot. Gaz., 1943, **105**: 152-64, bibl. 18.
The studies reported have a bearing on the problems encountered in irrigation agriculture where saline conditions exist.

444. WRIGHT, K. E. 631.85: 632.19
Internal precipitation of phosphorus in relation to aluminum toxicity.
Plant Physiol., 1943, **18**: 708-12, bibl. 20.
That the inactivation of phosphorus by aluminium, principally in the roots, creates an actual deficiency of phosphorus in the various meristematic regions of the plant with resultant poor growth is confirmed by recent investigations at the Rhode Island Experiment Station.

445. NELSON, R. C., HAMM, P. C., AND TSIANG, Y. S. 581.192: 535.33
Spectrographic analysis of plant ash for several elements simultaneously.
Plant Physiol., 1943, **18**: 699-703, bibl. 4.
A method is described for determining a number of elements simultaneously in ash samples using an increased number of exposures, simple density measurements without internal standardization, and a procedure for establishing a calibration curve without the use of an artificial standard. This technique was adapted to the analysis of samples of brome grass for iron, manganese, copper, calcium, potassium and magnesium. [Authors' summary.]

446. NIELSEN, N., AND JOHANSEN, G. 631.461.5
Untersuchungen über biologische Stickstoffbindung. 3. Einfluss der Wasserstoffionenkonzentration und des Kupfers auf das Wachstum von *Bacterium radicicola* bei Verwendung verschiedener Stickstoffquellen. **(Biological nitrogen-fixation. 3. Effect of hydrogen-ion concentration and copper upon the growth of *Bacterium radicicola* with different sources of nitrogen.)**
Trav. Labor. Carlsberg, Sér. physiol., 1940, **23**: 139-45, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 1.
Minute amounts of copper in the presence of ammonium sulphate checked the growth of *Bacterium radicicola*.

447. REEVE, E., AND SHIVE, J. W. 546.27: 632.19
Potassium-boron and calcium-boron relationships in plant nutrition.
Soil Sci., 1944, **57**: 1-14, bibl. 14.
The external symptoms in tomato plants of excess and deficient boron are accentuated progressively with increasing potassium concentrations in the nutrient substrate. In the tissues of the plant at any given boron level in the substrate the boron content will increase as the potassium concentration in the substrate increases. Increasing concentrations of calcium will accentuate the symptoms of boron deficiency but, contrary to the effect of potassium at high boron levels, have the effect of decreasing both total and soluble boron. The accumulation of calcium in the tissues is largely determined by the calcium concentration in the substrate and appears to be independent of boron. While the Ca/B ratio decreases with the increase of potassium concentration of the nutrient substrate, calcium has little effect on the K/B ratio values. The response of the tomato plant toward boron appears to be determined by the direct and intimate relation between calcium and boron in metabolism, but potassium appears to influence the response of the plant to boron indirectly through its determinative effects upon the processes involved in the absorption and accumulation of calcium. The work was done at the New Jersey Experimental Station. [From authors' summary.]

448. JONES, H. E., AND SCARSETH, G. D. 546.27: 631.811.9
The calcium-boron balance in plants as related to boron needs.
Soil Sci., 1944, **57**: 15-24, bibl. 16.
In greenhouse pot experiments on Indiana farm crops at Purdue University it was found that plants will take up varying quantities of calcium and boron from the soil but that each plant has a specific need for Ca and B which differs with the variety. If this balance is upset by deficient intake of calcium, as on acid soils, the plant's tolerance for boron will be low. On alkaline soils the excess calcium may also upset the balance, since the plant may then require more boron than is available. In practice, farmers should look out for boron starvation on over-limed soils and, if borax must be applied to acid soils, the quantities should be small. For tobacco the ideal Ca/B ratio is 1,200: 1 by weight, for soybeans 500: 1, for sugar beet 100: 1.

449. BERGER, K. C., AND TRUOG, E. 546.27: 581.192
Boron tests and determination for soils and plants.
Soil Sci., 1944, **57**: 25-36, bibl. 11.
A description of the quinalizarin method for the determination of boron in soils and plants with special reference to recent improvements.

450. COLWELL, W. E., AND CUMMINGS, R. W. 546.27: 631.811.9
Chemical and biological studies on aqueous solutions of boric acid and of calcium, sodium and potassium metaborates.
Soil Sci., 1944, **57**: 37-49, bibl. 23.
A study was made at Cornell University of aqueous solutions of calcium, sodium, and potassium metaborates and of sodium tetraborate in pure chemical systems and in relation to absorption of boron by plants.

451. WALKER, J. C. 546.27: 632.19
Histologic-pathologic effects of boron deficiency.
Soil Sci., 1944, **57**: 51-4, bibl. 3.
The effects of boron deficiency on beet and cabbage at Wisconsin Experiment Station are described. The histologic study showed that boron deficiency may retard growth without producing any macroscopic symptoms.

Growth substances.

452. GRAHAM, R. J. D. 631.535
Presidential address. (Vegetative propagation by cuttings.)
Trans. bot. Soc. Edin., 1943, **33**: 347-56, bibl. 50.
The theme of the Presidential Address is a review in the light of recent knowledge of phytohormones of the phenomenally successful achievements of L. B. Stewart of the Royal Botanic Garden, Edinburgh, in the propagation of plants by cuttings.

453. ČAJLAHJAN, M. H., AND TURECKAJA, R. H. 577.15.04: 631.535
Brief instructions for rooting cuttings with the aid of synthetically prepared plant growth substances. [Russian.]
Publ. Timiriazev Inst. Plant Physiol. Acad. Sci. U.S.S.R., 1942, pp. 32.
It may be of interest to note certain of the points stressed

in this Russian manual on the use of β-indolylacetic acid, β-indolylbutyric acid and α-naphthaleneacetic acid in the rooting of cuttings, in liquid, powder or paste form. Whichever substance is employed, its concentration should be greater for woody than for herbaceous cuttings. All are toxic if too concentrated, or if the cuttings are immersed in solutions of them for too long. Green cuttings should be severed perpendicular to the stem and be 10 to 12 cm. long, some of the leaves being retained. Woody cuttings, 15 to 25 cm. long, are cut slanting in order to provide a large absorbing surface, which may be further extended by splitting and longitudinal cuts. To facilitate the formation of callus and roots, a portion of the preceding year's wood may be included in the cutting, a method which has been found especially effective in the rooting of magnolia, juniper, holly and rhododendron cuttings. The age of the parent plant is important. Cuttings root best when taken from young shrubs and trees, and those taken from young trees root better than those from young shoots of old trees. Cuttings from the youngest parts of herbaceous plants, at the tips of shoots, are often the most successful. Water solutions enable many cuttings to be treated simultaneously and are the most convenient of the three forms described. A fresh solution, even if kept in the dark, ceases to be effective after seven days. Herbaceous cuttings are kept in the solution for 2 to 6 hours, woody cuttings for 12 to 48 hours. The period of immersion should be longer in autumn and winter than in spring and summer. The powder form is considered especially suitable for green cuttings of herbaceous type (e.g. geranium and cinchona) and paste for cuttings which are difficult to root such as apple and pear. The best method of applying it is to ring the twig and then smear the paste over the cut. After immersion, powdering or smearing, the cuttings are planted in sand, either pure or mixed with mould, where they remain until rootlets have been formed, after which they are ready to be planted out. For success there must be the least possible delay between taking the cutting and treating it, and between treatment and setting in sand or mould. The last mentioned stage having been reached, temperature, aeration, and moisture are the main considerations. For most cuttings, 18° to 35° C. are suitable. Willows need temperatures of 16° to 18° C., the citrus species, cinchona and *Euonymus japonica*, 25° to 30° C. Holly at 15° C. roots in 42 days, at 20° C. in 28 days, at 24° C. in 21 days, and at 27° C. in 18 days. Adequate lighting is especially important for summer cuttings with leaves and for evergreen woody cuttings. The light should be diffused. The propagation of the following trees, shrubs and other plants with the aid of plant growth substances is discussed: *Poncirus trifoliata*, *Olea* spp., *Euonymus japonica*, *Pinus*, *Taxus* and other species of conifer, *Salix cuprea*, the potato, geranium and chrysanthemum. There is also a list of plants with information about each regarding optimum concentration of and period of immersion in the solutions of the substances, and the ratio of success in treated and untreated cuttings.

454. GUSTAFSON, F. G. 577.15.04

A comparative study of different methods of determining activities of growth-promoting substances.
Amer. J. Bot., 1943, **30**: 649-54, bibl. 16.

There is no unanimity among investigators as to the accuracy or appropriateness of the many methods employed to measure the response of plants to various growth-promoting substances. These experiments carried out at Michigan University on 17 such compounds showed that no one was equally effective in all of the 7 tests employed. Tests to be used should be chosen in accordance with the information desired, since some are better suited than others to measure specific activities. Examples of this are given. Modifications in the structure of the nucleus of a compound profoundly influence its activities.

455. BAUCH, R. 577.15.04

Über Beziehungen zwischen polyploidisierenden carcinogenen und phytohormonalen Substanzen. Auslösung von Gigas-Mutationen der Hefe durch pflanzliche Wuchsstoffe. **(On the relation of polyploidy- and cancer-producing substances and phytohormones. The production of gigas-mutations in yeasts by means of plant growth substances.)**
" *Naturwiss.*, 1942, pp. 420-1, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 119.

In his investigations on the influence of naphthalene derivatives upon yeasts the author found that yeasts constitute a particularly suitable material for testing the relative effect of plant growth substances.

456. DOSTÁL, R. 581.14: 635.976.32 + 633.491

Über das Frühtreiben der Fliederzweige (*Syringa vulgaris*) und Kartoffelknollen (*Solanum tuberosum*) durch Verletzung und die hormonale Deutung dafür. **(The forcing of lilac branches and potato tubers by means of injury and the hormonal interpretation of this phenomenon.)**
Gartenbauwiss., 1941, **16**: 195-206, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 7-8.

(1) On 17 October this year's lilac branches (Charles X) with firmly adhering leaves were split at their basal ends and put into water, after separating the wood from the bark and removing the former. The leaves of the treated branches fell. On 30 October the branches, immersed up to the wood, were brought into a greenhouse. By 5 November inflorescences with normal but smaller white flowers had developed from the terminal buds, whilst the controls did not show any development. Pre-treatment of the operated branches with heteroauxin solutions in various concentrations did not further improve flowering. According to the author, it is the hormone production in the bast and cambium which causes early flowering after bark injury. Horse chestnut branches behaved in the same way as lilac. (2) Scorching buds and particularly potatoes (for instance at the hilum end) for a second over a candle also caused development of the inflorescences and sprouting of the apical buds in potato tubers, in most cases within a week. The effect of scorching upon sprouting was still more remarkable in cut potato tubers. It is thought that the wound substances produced by the burn activate the growth substances. *Avena* tests showed that scorched potato tubers had a 77% higher growth substance content than the controls if the whole surface was scorched, and a 35% higher content if only the basal surface of the tuber was exposed to the flame. Also *Phytophthora*-infested tubers, which sprout immediately after harvest, showed a remarkably high growth substance content compared with healthy tubers (1: 2·1 to 1: 2·9). The investigations were carried out at Brno, Czechoslovakia.

457. CARLTON, W. M. 577.15.04: 581.144.2

Histological and cytological responses of roots to growth-regulating substances.
Bot. Gaz., 1943, **105**: 268-81, bibl. 21.

Experiments with onion, tulip and narcissus var. Paper White.

Noted.

458. S. RHODESIA DEP. AGRIC. BRANCH OF PLANT PATHOLOGY AND BOTANY. 578.08

Botanical specimens for identification.
Reprinted from *Rhod. agric. J.*, 1944 (?), pp. 2.
How to collect and despatch.

GEIGER, R. 581.036

Das Klima der bodennahen Luftschicht. Ein Lehrbuch der Mikroklimatologie. **(The climate of the air layer close to the soil. A textbook of microclimatology.)**
Friedr. Vieweg & Sohn, Brunswick, second complete revised edition, 1942, pp. xvi + 435, RM. 18, from review *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 73.

SCHIEMANN, E. 633/635: 576.1
Entstehung der Kulturpflanzen. **(The origin of cultivated plants.)**
Erg. Biol., 1943, **19**: 409-552, bibl. 566, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 141.

MATHER, K. 581.162.5
Genetical control of incompatibility in angiosperms and fungi.
Nature, 1944, **153**: 392-4, bibl. 15.

PEREZ-LLANO, G. A. 582.9
Lichens. Their biological and economic significance.
Bot. Rev., 1944, **10**: 1-65, bibl. 233.

BEETLE, A. A. 581.9(826)
Phytogeography of Patagonia.
Bot. Rev., 1944, **9**: 667-79, bibl. 54.

PFEIL, E., AND TRITT, A. 631.87
Über den landwirtschaftlichen und gärtnerischen Nutzwert von Müll. **(The utilization of refuse in agriculture and horticulture.)**
Bodenk. PflErnähr., 1943, **29**: 370-82, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 140.

HEYL, W. 581.144.2: 631.43
Der Einfluss der Bodenstrukturerkrankungen auf die Wurzelentwicklung landwirtschaftlicher Kulturpflanzen. **(The influence of defects in soil structure on the root development of agricultural plants.)**
Kühn Arch., 1942, **56**: 215-45, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 140.

FRÖMEL, W. 631.411.4: 612.014.44
Über Humus und Huminsäuren. Ein methodischer Vergleich auf Grund von Untersuchungen über die Adsorption und von Messungen der Lichtadsorption. **(On humus and humic acids. A methodical comparison based upon investigations on adsorption and measurements of light adsorption.)**
Landw. Jb., 1942, **92**: 94-154, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 105-6.

RUSCHMANN, G., AND OTHERS. 631.87
Der Einfluss des Humusdüngers "Huminal B" auf das Pflanzenwachstum und die Bodeneigenschaften. **(The influence of the humus fertilizer Huminal B on plant growth and soil properties.)**
Landw. Jb., 1942, **92**: 53-93, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 106-7.

GUSTAFSON, F. G. 631.871: 634.95
Decomposition of the leaves of some forest trees under field conditions.
Plant Physiol., 1943, **18**: 704-7, bibl. 5.

RAYNER, M. C. 631.875: 634.95
The use and significance of composts in forestry.
Ann. appl. Biol., 1943, **30**: 397-9.

MELVILLE, R. 634.972.8(410)
The British elm flora.
Nature, 1944, **153**: 198-9.

RICHARDS, L. A., AND WEAVER, L. R. 631.432
The sorption-block soil moisture meter and hysteresis effects related to its operation.
J. Amer. Soc. Agron., 1943, **35**: 1002-11, bibl. 7.

HIBBARD, P. L. 546.47: 631.811.9
Comparative amounts of zinc extracted from soils by a chemical solvent and by plants.
Soil Sci., 1943, **56**: 433-42, bibl. 7.

HILL, R. 581.192
Tetrapyrrolic compounds in plants.
Biochem. J., 1943, **37**: xxiii.

HUBER, B. 581.13
Gesichertes und Problematisches in der Wanderung der Assimilate. **(Proved and problematic hypotheses on the migration of reserve materials.)**
Ber. dtsch. bot. Ges., 1941, **59**: 181-94, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 5.

EATON, F. M. 581.11
The osmotic and vitalistic interpretations of exudation.
Amer. J. Bot., 1943, **30**: 663-74, bibl. 39.

LAIBACH, F. 577.15.04
Zur Entstehung des pflanzlichen Wuchsstoffes Auxin. **(The production of the plant growth hormone in the plant.)**
Forsch. u. Fortschr., 1942, **18**: 156-8, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 142.

LINK, G. K. K., AND EGGERS, V. 635.64: 577.15.04
Enhanced auxinic activity of tomato tissues in presence of l-tryptophane.
Bot. Gaz., 1943, **105**: 282-4, bibl. 9.

TREE FRUITS, DECIDUOUS.

General.

459. JOHANSSON, E. 634.1/7 + 664.85
Nyare undersökningar på fruktodlingens område. **(Recent fruit research.)**
Sverig. pomol. Fören. Årsskr., 1943, **44**: 80-7, bibl. 11.

In this review of recent fruit research it may be of interest to note some points of the survey, which refer to Scandinavian and German papers not available at present. *Fruit storage* (Krumbholz, G., *Vorratspfl. Lebensm.forsch.*, 1943, 6: 67). The apple varieties tested are divided into 4 groups according to their storage capacity, a few varieties being specified in the review. Especially for storage at low temperatures the fruit should be well developed but not too ripe when stored. Belle de Boskoop could only be kept for a little while after removal from cold store. Most varieties developed a better flavour and colour and were less susceptible to internal browning when stored at 2-3° C. than when stored at 1-2° C. An after-storage temperature of 12-15° C. for 8-14 days is recommended. Kaess (*Gartenbauwiss.*, 1943, 17: 591), working on gas storage, showed that the best conditions for Blenheim were an atmosphere of 8% CO_2, 2% O_2 and 90% N with a temperature of 4·5° C. With Gold Pearmain, satisfactory results were obtained at 4·5° C. in an atmosphere of 2% CO_2 and 2-4% O_2. If storage was continued up to April, full maturity was not reached, even on after-ripening at 8-12° C. Gas storage also improved the keeping quality of Williams pears. For shorter periods, losses were small at 0·5° C. in a CO_2 concentration of 4%—the sum of CO_2 + O_2 could be raised to 21%—and after-ripening proceeded well at 10-18° C. In 4-6 months storage tests the smallest losses occurred in an atmosphere of 2% CO_2 and 2% O_2, but the flavour was better after storage in 4% CO_2 and 2% O_2. The prospects of satisfactorily gas storing Williams are considered promising. A Finnish paper (Meurman, O., *Publ. agric. Exp. Activ. St.* 120, 1943; in English) deals with the *Depth of planting apple trees*. Trees were planted in the autumn of 1932, (1) at the same depth as in the nursery, (2) somewhat deeper so that the union came below the ground, (3) deep, so that the union was 10 cm. below the surface. In 1936 the stems showed an average increase in diameter of 0·69, 0·76 and 0·89 cm. respectively. Up to 1939, when the trials were discontinued because of the severe winter, and considering only the early bearing varieties, the trees planted fairly and very deep yielded 50% and 75% respectively more than those planted at the usual depth. The stocks were seedlings and the soil was light sand with a clay subsoil. The reaction of trees in loam soils will have to be studied. Möhring, H. K. (*Dtsch. Obstb.*, 1943, p. 28)

worked out three methods of raising fruit varieties on their own roots [for which see Abstract 494]. Kemmer, E. (*Dtsch. Obstb.*, 1943, p. 155) is studying the effect of repeated ringing on the yield of apple and pear trees. Wounds produced by cutting out bark rings up to 15 cm. and more in width were found to heal very quickly if the cambium was left and the operation carried out in June or July. Maurer, K. H. (*Dtsch. Obstb.*, 1942, p. 205) described three types from his collection of *Malus prunifolia*, two of which are considered to be suitable stocks for standard trees [see also Abstract 479]. As Johansson, A. (*Medd. Statens Trädgårdsförs*, 18, 1943) reported in his experiments at Alnarp, the application of 0·5 litre formalin or of 0·6 or 0·9 litres carbolineum made up with water to 10 litres per m² had a stimulating effect on the growth of young trees in the nursery.

460. Nilsson, F. 634.1/7
Förutsättningar och arbetsuppgifter för växtförädlingen av fruktträd. **(Raising the standard of fruit tree performance.)**
Sverig. pomol. Fören. Årsskr., 1943, **44**: 5-16, bibl. 28.

The application of recent scientific results to practical fruit growing would lead to an increase in the number of fruit trees and to a better performance of individual trees in Sweden. The aim of Swedish fruit production is, as defined, to make the country self-supporting by growing a selection of suitable varieties varying in time of maturity and keeping quality.

461. (Lisavenko, M. A.) 634.1/8(57)
In the People's Commissariat of Agriculture of the Russian S.F.S.R. The activities of the Altai (Siberia) Horticultural Station 1934-42. [Russian.]
Socialističeskoe Seljskoe Hozjaistvo (Socialistic Agriculture), 1942, No. 4, pp. 71-2.

Since its foundation the Altai Horticultural Station has supplied collective and state farms with very large numbers of seedlings and cuttings of fruit trees, bushes and grape vines. The material has included apple, pear and plum seedlings and plum-pear hybrids, as well as currants, gooseberries, raspberries, strawberries and vines. The station is situated in the vicinity of the town Oirot-Tura in the Oirot Autonomous S.S.R. and has during the 8 years of its existence become an important horticultural research centre, not only for the Altai Territory but for other regions of Siberia as well. Michurin's methods were mainly followed in the study of 250 varieties of apple (41 of which were Michurin's varieties); considerable progress has also been achieved with pears, plums, cherries, grapes, mountain ash, etc. So successful was the work of the station that it has become self-supporting, and since 1941 has received no grants from the federal Government; and it will be shortly reorganized as a zonal horticultural station.

462. Žembrovskiĭ, I. M., Krutikov, N. E., and Ažigoev, P. K. 634.1/7
A programme of agricultural investigations to be undertaken at the Kazah Agricultural Institute. [Russian.]
Bjull. Kazah. Naučno-issled. Inst. Zemled. im Akad. V.R. Viljjamas, 1940, No. 5-6, pp. 39.

The whole of the present bulletin is devoted to a programme of investigations which is to be carried out in all branches of agriculture at the Kazah Agricultural Experiment Station. In the part of it relating to horticulture and fruit-growing the following are some of the problems to be examined: premature yellowing of cucumbers, the cultivation and utilization of the Jerusalem artichoke and growing vines as a means of stabilizing sands and sandy soils. Attention is also to be given to replacing some local fruit varieties, " which ", it is stated, " have begun to degenerate as a result of continuous propagation by cuttings which are old as regards phasic development ". It has been found that some varieties, such as the Aport apple and the Victoria plum, have become acclimatized to the conditions in the region of Alma-Ata, and their quality has been improved as compared with that in their place of origin.

463. Clausen, H. 634.1/8-1.55: 581.055
Witterung und Obstertrag. **(Weather and fruit yields.)**
Gartenbauwiss., 1943, **17**: 603-15, bibl. 9.

An interpretation of climatic data, recorded in Holstein, Germany, demonstrating the effect of rain and temperature on the yields of fruit trees. The material is tabulated for the periods 1916-35 and 1921-41. Two tables show the effect of summer rain on fruit yields.

464. Kaempfert, W. 551.521: 634.1/2
Zur Besonnung südseitiger Spaliermauern. **(Sun radiation on espalier walls facing south.)**
Gartenbauwiss., 1943, **17**: 531-42, bibl. 10.

Observations and calculations carried out at the Agricultural Metereological Station, Trier, Germany.

465. Howard, A., and McIntyre, G. A. 634.1/8
A survey, census and statistical study of the horticultural plantings on the Murrumbidgee Irrigation Area, N.S. Wales.
Bull. Coun. sci. industr. Res. Aust. **168**, 1943, pp. 88.

The following, among other points, are brought out by this survey. Crops in the area are found to decrease in susceptibility to autumn flood and wet winter conditions in the following order—peaches, apricots, citrus, apples, prunes, and vines. As regards irrigation, low watertable and high coverage are associated with greater spread and better health for all crops, as are also high total amount of water and frequent application, except possibly in the case of citrus. There is general agreement that heavy applications of organic manures and nitrogen are associated with better health. Phosphates, however, seem to have no such effects, and potash only as regards citrus and vines. Only in the case of peaches is there definite evidence that replants are worse than original plantings on the same spot. A significant difference in favour of tractors as against horses for use in the vineyard is discussed.

466. Koydl, S. 634.1/3(497.13)
Vom Obstbau in Kroatien. Ein Kurzbericht. **(Fruit growing in Croatia. Short report.)**
Dtsch. Obstb., 1942, **57**: 200-3, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 115-6.

A stocktaking of fruit trees in Croatia. The figures refer to million trees:—Plum, nearly 15; apple, 2·5; pear, 1·7; walnut, 1·2; olive, 2; sweet and acid cherries, over 1; peach, 0·5; fig, 0·5. There are, moreover, considerable numbers of apricots, quinces, chestnuts and almonds. Lemons and oranges are also grown.

467. Trelles, J. B. 634.11(82)
El manzano. **(Apple growing in Argentina.)**
Bol. Frut. Hort. B. Aires, 1939, Vol. **4**, No. 37, pp. 90.

A manual on apple growing in Argentina. The usual routine of cultivation, pruning, disease control, harvesting and storage is covered. The rootstocks advised for commercial orchards are seedlings grown from any seed available and Northern Spy with a preference for the latter on account of its immunity to woolly aphis. Winter Magetin is also supposed to be immune and is sometimes used, and the same can be said of the Chilean variety Huidobro or Araucano. Quince is sometimes used in the Delta zone for the varieties Cara sucia, Blanquita and one or two others, but with most varieties compatibility is poor. Dwarfing stock is not appreciated.

468. Bishop, W. J. 634.23
Cherry culture in the Adelaide Hills.
J. Dep. Agric. S. Aust., 1943, **47**: 58-63.
All aspects of cherry culture in the Adelaide Hills, South Australia, are described by a local grower. Especial mention is made of the outstanding variety, Williams Favourite, a locally raised seedling; it is a vigorous, heavily bearing tree, whose fruit is characterized as "practically perfect" and most satisfactory for cold storage.

469. Garcia, D. A., Croce, F., and others. 634.25(82)
El duraznero. **(The peach in Argentina.)**
Bol. Frut. Hort. B. Aires, 1936, Vol. **1**, No. 10, pp. 56.
A manual of peach growing in Argentina. The rootstocks advised are seedling peach for ordinary peach soils and the almond for poor dry soils, provided they have depth. The seedling peach stock should be raised from a variety known as criollo (native) or aurimelo, bearing small fruits and of vigorous growth, commonly found in old orchards in the Andean provinces and in the Cordoba and San Luis mountains. The almond stock is best from hard shelled bitter almonds.

470. di Martini, F. 634.63
L'olivicoltura in Libia. **(Olive growing in Libya.)**
Terra e Lavoro, 1941, Nos. 9-10, from review in *Agric. colon.*, 1942, **36**: 27-8.
In 1935 estimates gave over 800,000 olive trees, most of which are in western Libya. In 1937, 1,644,000 plants in Tripolitania and 143,000 in Cirenaica. Production of oil in Libya around 26,000 quintals annually. Of the above trees, only 150,000 were 10 years or over in 1937, and full production requires 25 years. Production should increase up to 63,000 to 84,000 quintals. If planting is increased to 4,000,000 trees, production should rise to 95,000 up to 130,000 quintals. G.W.A.

Varieties.

471. Dahl, C. G. 634.11+634.13+634.22
Pomologi. Beskrivningar över de viktigaste i Sverige odlade fruktsorterna. Del I: Äpplen. Del II: Päron och plommon. **(Pomology. Descriptions of the more important tree fruit varieties grown in Sweden. Part I: Apples. Part II: Pears and plums.)**
Second revised and enlarged edition, A. Bonniers förlag, Stockholm, 1943, pp. 690, Kr. 83, from review *Fruktodlaren*, 1943, Nr. 6, pp. 176-7, and *Sverig. pomol. Fören. Årsskr.*, 1943, **44**: 240-1.
One hundred and twenty-eight apple varieties, 80 pear varieties and 54 plum varieties are dealt with. This second edition of the book, which contains 67 colour plates, is highly praised by the reviewers.

472. Lundin, Y. 634.1/7(485)-1.524
S.P.F: snya fruktsortlistor. **(The Swedish Pomological Association's new lists of fruit varieties.)**
Sverig. pomol. Fören. Årsskr., 1943, **44**: 176-81.
In a lecture given before a meeting of the Swedish Pomological Association in August 1943, the author again emphasized that a substantial reduction in the number of varieties is a vital condition for the improvement of fruit growing in Sweden. A list of suitable varieties compiled by the Pomological Association is discussed. The country has been divided into 6 zones and it is stated for every variety in which of the zones it can be successfully grown. The list contains 25 apple, 13 pear, 9 plum and 8 cherry varieties.

473. Magnusson, K. 634.1/7-1.524
Var tiden mogen? Några anmärkningar till pomologiska föreningens senaste sortlista. **(Some remarks on the latest variety-list of the Swedish Pomological Association.)**
Sverig. pomol. Fören. Årsskr., 1943, **44**: 182-7.
Further remarks on the above mentioned list with special reference to frost hardiness. The last three winters, the coldest since Swedish records began 200 years ago, may suggest that the country finds itself on the verge of a new climatic period.

474. Zaeč, V. K. 634.11-1.52(47)
American varieties of apple in the Orel Territory. [Russian.]
Vestnik Plodovo-Jagodnye Kul'tury (*Fruit Crops*), 1940, No. 3, pp. 26-31.
This is a critical and biological survey of the productivity and of the comparative merits and demerits under local conditions, of the following apples introduced from America: (1) Wealthy; (2) McIntosh; (3) Jonathan; (4) Fameuse; (5) Grimes Golden; (6) Baldwin; (7) Rhode Island Greening; (8) Ben Davis; (9) Delicious.

475. Budagovskij, V. I. 634.11-1.541.11
Marga hndzor, a dwarf apple. [Russian.]
Vestnik Plodovo-Jagodnye Kul'tury (*Fruit Crops*), 1940, No. 3, pp. 19-23.
Field tests and morphological analysis showed that Marga hndzor (*Malus pumila*)—a dwarf apple indigenous to Armenia—is identical with the French Paradise, Malling VIII. Its resistance, early maturity, heavy cropping and ease of vegetative propagation make it eminently suitable for use not only as a dwarf stock but as a basic strain for pure breeding.

476. Gur'ev, P. G. 631.521: 634.11+634.22
New kinds of apple and plum for the Leningrad Territory. [Russian.]
Vestnik Plodovo-Jagodnye Kul'tury (*Fruit Crops*), 1940, No. 3, pp. 14-8.
A description of four new kinds of apple and two of plum produced at the Oredez horticultural field station: (1) Albino—from Sujslep×Golden Noble; (2) Kolhoznoe—Antonovka×Signe Tillish; (3) Pearl Reinette—Reinette green×Orleans Reinette; (4) Reinette grey—Borovinka×Reinette Blenheim; (5) Viala plum of unknown origin; and (6) Ciana, obtained from the seed of an ordinary Hungarian plum. All these are said to have shown great winter hardiness and to have produced abundant crops.

477. Clore, W. J. 634.25
The place of new peach varieties.
34th A.R. Ore. St. hort. Soc. (*57th annu. Meet., 1942*), 1943, pp. 42-50.
Descriptions are given of 41 peach varieties introduced into trials at the Irrigation Branch Experiment Station near Prosser, Washington, some in 1922, others in 1928, 1930, 1931 and 1937 onwards. Other factors affecting the desirability of introducing particular varieties are also discussed.

478. Ginai, M. A., and Mustafa, A. M. 634.25
The behaviour of certain Californian peaches under Quetta conditions.
Ind. J. Hort., 1943, **1**: 35-47.
Descriptions are given of 22 peaches, mainly Californian, proved to be successful in Baluchistan, with notes on the purposes for which they are best suited. A brief review of market prospects considers the competition to be faced from other peach growing districts and the best way to meet it. Although a peach is judged from its appearance and quality from a commercial point of view, the most important factors are its season and its suitability for export.

479. MAURER, K. J. 634.11-1.541.11-2.111
Drei Typen von *Malus prunifolia*. **(Three types of *Malus prunifolia*.)**
Dtsch. Obstb., 1942, **57**: 205, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 115.
A collection of about 40 *Malus prunifolia* forms is being grown for closer examination in eastern Germany. In respect of their frost resistance the author distinguishes three types:—type 1, greatest frost resistance; type 2, somewhat more vigorous and less frost resistant. The average fruit weight of both types is 25 g.; type 2 is a suitable rootstock. Type 3 is dwarfing and less frost resistant than 1 and 2, the average fruit weight being 10 g.

480. KOVALEV, N. V. 634.22-1.521
Myrobalan (*Prunus cerasifera* Ehrh.), its varieties and the cultivated types. [Russian.]
Vestnik Plodovo-Jagodnye Kul'tury (*Fruit Crops*), 1940, No. 3, pp. 32-9.
This is a critical ecological survey of the wild and cultivated trees classified under six main geographical groups: (1) the Balkan with three, (2) the Northern Caucasian—nine, (3) the Colchidic—twenty, (4) the Armenian-Iranian—six, (5) the Caspian—three, and (6) the Crimean—ten varieties; mention is also made of some of the Central Asiatic, Kashgar and Indian types. Tests conducted at the Majkop station and elsewhere proved its suitability for canning and jam making; for the purposes of hybridization and selection, the Northern Caucasian varieties showed the greatest cold resistance, those from Western Georgia produced large fruits and abundant yields, whereas the drought-resistant varieties came from Armenia.

481. KALMYKOV, S. 634.22
The myrobalan in Kazahstan. [Russian.]
Bjull. Kazah. Naučno-issled. Inst. Zemled. im Akad. V.R. Viljjamas, 1940, No. 1-2, pp. 15-7.
After a short description of the myrobalan, the appearance of the tree, its usual habitat, and fruit characteristics, the author gives some facts and figures about four strains which have been selected at the Kazah Agricultural Institute. The fruits of these strains are described as red, dark purple, yellow-amber, and greenish yellow respectively. The weight and dimensions of these fruits are also given, as well as the proportion by weight occupied by the stone. Improvements are being introduced by means of grafting, for which purpose the best available varieties of myrobalan, plum and apricot have been used. Bark grafts were made, and union was effected in 70 to 100% of cases. It is believed that the cultivation of myrobalan would be possible in the northerly parts of Kazahstan.

482. KALMYKOV, S. S. 587.34
A large-fruited species of hawthorn. [Russian.]
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljjamas, 1940, No. 7-8, pp. 19-22.
This species of hawthorn grows wild in southern Kazahstan, and its fruits are eaten. They find a ready sale in the towns, and at a fairly high price. The tree is about 9 metres high with what is described as a "very striking" trunk and a round crown somewhat high above the ground. The leaves are dissected, flat and leathery. It is very resistant to drought and is able to grow on hot dry southern slopes up to an altitude of 1,500 metres. It flowers late—between the end of May or beginning of June in Kazahstan—and thereby avoids the danger of late spring frosts. The fruit ripens in October, and the average yield per tree is about 50 kg., that of individual trees being large in some years and small in others, though in any one season it is not exclusively one or the other in all the trees of a grove. Where there is sufficient moisture this alternation of yield does not occur. The fruit is large, being about 25 mm. in diameter, flattened, with prominent ribs, yellow in colour, sometimes with a rosy tinge and red spots. It contains two or three pips forming about 20% of it by weight. The flesh is tender, juicy and with a strawberry flavour; acidity and sweetness are happily combined in it. It contains 14·7% of sugar and 0·77% of acids. Though soft, the fruits will stand transport. Even when much bruised, they do not decay for a long time. Experiments in making jam, fillings for sweets and pulp which were carried out at the Kazah Agricultural Institute, have shown that the fruit contains a high proportion of pectins, and that the products made from it are satisfactory. Experiments are also being made to find means of bringing the species under cultivation and to improve its qualities. An obstacle to its propagation and improvement is the difficulty in getting the seeds to germinate in under 2 or 3 years. The grafting of cultivated varieties of apple, pear, and quince on the hawthorn stock was successfully accomplished, union between the stock and scion having taken place in 85% of cases.

Breeding.

483. SCHMIDT, M. 634.11-1.523-2.111
Kreuzung und Auslese bei Obstgehölzen. **(Hybridization and selection in fruit trees.)**
Forschungsdienst, 1943, **16**: 191-2.
A brief account of some breeding work with fruit trees carried out at the Erwin-Baur Institute, Müncheberg, Germany. Special mention is made of crosses between wild apple species such as *Malus baccata*, *M. prunifolia*, *M. zumi*, *M. subbaccata* and others with valuable but frost susceptible varieties, with the aim of combining high quality with frost resistance. It was, however, found so difficult to eliminate the undesirable characters of the wild forms that the plan had to be abandoned. Instead it is hoped that the large collection of seedlings, raised from crosses between varieties and from open pollination, will provide suitable material for selection. In 1940 the degree of frost damage suffered by individual seedlings during the exceptionally severe winter of 1939/40 was evaluated and the mode of inheritance of frost resistance was determined. Further work proceeds on the basis of these results, the frost resistance of buds and blossoms being concurrently tested in cold chambers.

484. RUDORF, W. 634.1/7-1.523
Züchtungsforschung an den Obstarten (Edelsorten). **(Breeding top and small fruits.)**
Forschungsdienst, 1942, *Sonderh.* **16**, pp. 472-81, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 157-8.
A report of the breeding work on fruit carried out by the horticultural section of the Forschungsdienst during recent years. The subjects dealt with are: Frost resistance in stone and pome fruit, resistance to scab and woolly aphis and brown rot. The second part is devoted to soft fruits.

485. SCHMIDT, M. 634.1/2-2.111-1.523
Beiträge zur Züchtung frostwiderstandsfähiger Obstsorten. **(The breeding of frost resistant fruit varieties.)**
Züchter, 1942, **14**: 1-19, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 17-8.
In breeding for frost resistant fruit varieties 11,559 apple, 2,498 pear, 163 cherry and 413 plum seedlings were classified at Müncheberg, Germany. The material consisted of the 6-11-year-old progeny from, in most cases, openly pollinated varieties or variety crosses and in the case of pome fruit also from crosses of varieties with hybrids, of variety crosses with species and of crosses of variety-species hybrids with varieties. In the final evaluation of frost resistance after the severe winter 1939/40 the trees were divided into three groups: healthy, damaged, and dead. The following apple varieties proved frost resistant: Transparent de Croncels, Danziger Kantapfel, Northern Spy, Prinzenapfel, Säfstaholm; slightly frost susceptible: Charlamowsky

(Oldenburg), Yellow Bellflower, Gold Rennet Frh. v. Berlepsch, Königlicher Kurzstiel, Peasgood Nonsuch, White Astrachan, White Transparent, to which the following varieties may be added which were not tested at all places but suffered only light damage at Müncheberg: Riesenboiken, Langton's Nonsuch, Red Astrachan, White Winter Calvill. Pears in general tend to be frost susceptible, as do plums also. In cherries, only among the acid cherries was frost damage nil or negligible. The behaviour of *Malus* species and species hybrids is interesting. *M. zumi* suffered moderate damage, whereas its hybrids (with Yellow Bellflower) were either not affected at all or only slightly. *M. baccata, M. niedzwetzkyana* and *M. prunifolia* remained healthy, *M. micromalus* suffered light damage. The frost resistance in the progeny of crosses is described at some length.

486. JOHANSSON, E. 634.11 +634.13
Undersökningar rörande högkromosomiga äpple- och päronträd. **(Investigations on apple and pear trees with high chromosome numbers.)**
Sverig. pomol. Fören. Årsskr., 1943, **44**: 55-60, bibl. 17, being *Meddel. Statens. Trädgårdsförsök* **22.**
The tetraploid apple seedling obtained at Alnarp from a cross Belle de Boskoop×Filippa and grafted on various stocks in 1938 flowered for the first time in 1943 on EM IX. There were 5 trusses with 14, partly very small, blossoms. Flowering coincided approximately with that of the parent varieties. The pollen was markedly bigger than that of either parent. Pollination with Early McIntosh, Cox's Orange and Laxton's Superb produced a fair number of seeds, the fruits being typical of the female parent variety. Only one malformed fruit, which was of poor flavour but of high vitamin C content, developed from pollination of the tetraploid blossoms with Early McIntosh. The investigations will be continued with the aim of producing new valuable triploid varieties from crosses of the tetraploid with diploid varieties. Brief mention is made of the Alnarp breeding work with pears.

487. ASCHAN, K. 634.11-1.523
Fortsatta undersökningar rörande avkomman av triploida äpplesorter. **(Further investigations on the offspring of triploid apple varieties.)** [English summary.]
Sverig. pomol. Fören. Årsskr., 1943, **44**: 61-70, bibl. 9.
Seven tetraploid seedlings have been found in the offspring of triploid apple varieties at Alnarp, 3 of them originating from Belle de Boskoop. The pollen from one of the two tetraploid seedlings raised by Nilsson-Ehle, which flowered for the first time in 1943, was found to be considerably bigger than that of a diploid variety and to be of equal germinating capacity. Measurements showed that stomata of diploid varieties are smaller than those of triploid and tetraploid varieties, the difference between the two latter being small.

488. WEIMARCK, H. 634.22
Fältstudier 1943 inom släktet *Prunus*. **(Field studies of the genus *Prunus* in 1943.)**
Sverig. pomol. Fören. Årsskr., 1943, **44**: 45-54, bibl. 11.
In the course of several journeys through Southern and Central Sweden the author studied the systematic position of *Prunus insititia* and hybrids of *P. insititia*×*P. spinosa.*

489. KAČEĬKO, A. N. 634.22: 634.25
Varieties and breeding of small and bush fruits in Kazahstan 20 years after the foundation of the Republic.
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljjamas, 1940, No. 9-10, pp. 8-14.
Notes on a successful greengage×peach hybrid and other hybrids.

490. LAMMERTS, W. E. 634.25: 612.014.44 +581.035
Effect of photoperiod and temperature on growth of embryo-cultured peach seedlings.
Amer. J. Bot., 1944, **30**: 707-11, bibl. 6.
Embryo-cultured peach seedlings can be brought into flower within two years of the pollination of their parent and can then themselves be used as parents in breeding work. However, varieties with a long chilling requirement often fail to grow rapidly or to flower when transplanted to the field. In these experiments it was found that varieties with a long chilling requirement make rapid growth if placed under continuous light at temperatures of 70°-75° F. minimum. When the seedlings have reached a height of from 2 to 4 ft., depending on varietal response, they are hardened off by exposure to a short day period at 45° F., after which they are given in February six weeks' cold storage in a dark room at 40° F. before planting out in April. These seedlings grow rapidly and flower the next year. The response of the embryo-cultured peaches here to longer photoperiod and higher minimum temperatures was inversely proportional to the chilling requirement of the seed parents. The investigations were carried out by the Division of Subtropical Horticulture, University of California.

491. SCHMIDT, M. 634.23-1.523
Forschungsaufgaben der Züchtung bei Kirschen. **(Aims of cherry breeding.)**
Dtsch. Obstbau, 1942, **57**: 41-6, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 18-9.
The work of the Erwin Baur Institute, Müncheberg, Germany, on cherry breeding is described. The prospect of obtaining frost resistant varieties are better for acid than for sweet cherries, a number of the former having proved hardy in the winter 1939/40. The author has been working for many years on the important problem of *Sclerotinia* resistance and he has succeeded in elaborating suitable infection methods. Some practically resistant varieties of sweet cherries were found, but none of acid cherries. From a cross sweet×acid some *Sclerotinia* resistant hybrids were obtained but a selection of morello seedlings after artificial infection seemed more promising and has already proved successful. The importance of breeding for self-fertility is also stressed.

Propagation and rootstocks.

492. COE, D. M. 634.1/2-1.536: 351.823.1
Principals of nursery stock certification.
Proc. Wash. St. hort. Ass. 39th annu. Meet. 1943, 1944, pp. 71-5, bibl. 7.
A discussion of the difficulty of certification of nursery stock and of attempts to establish certification schemes in Massachusetts, New York and Michigan. Any scheme must be subjected to such modifications as experience demands with the passage of time. The aim should be the achievement of superior products with the assurance of freedom from disease, but the requirements should not be too difficult for the average careful nurseryman to fulfil.

493. JAKOVLEV, L. I. 634.1/2-1.536
A substitute for transplanting.
Vestnik Plodovo-Jagodnye Kul'tury (*Fruit Crops*), 1940, No. 5, p. 114.
The method, which consists of cutting the tap root with a sharp knife when the seedling has produced its first leaf in spring* is recommended as a substitute for pricking out young seedlings of *Malus sylvestris* when grown in a dry climate. Though it has been found impossible, without pricking out, to produce a fibrous growth of roots, pricking out in a dry climate greatly retards the development of the seedlings. The method recommended by the author, who

* A similar practice is referred to by Overholser and other in *Pop. Bull. Wash. agric. Exp. Stat.* 170, 1943; *H.A.*, 13: 1160. —ED.

describes it as old but forgotten, produces seedlings having a more luxuriant growth of fibrous roots, and is less laborious than that of pricking out.

494. MÖHRING, H. K. 634.11-1.535.6
Zur Frage der Vermehrung unserer Obstsorten durch Wurzelschnittlinge. **(The propagation of our tree fruits from root cuttings.)**
Dtsch. Obstbau, 1943, **58**: 28-33, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 147-8.

For a study of the propagation of fruit trees by root cuttings, it was necessary to stimulate root formation of scion varieties. This was done by either of the two following methods: (1) A ¾ cm. strip of bark was scaled off the stems of one-year-old budded apples on M IX and the wound was covered with Belvitan paste. The trees were then planted deeply. Root formation, on the whole, was good, though some varieties responded better than others. The treatment was particularly successful with Croncels, Blenheim and Allington Pippin. Winter Gold Pearmain and Ontario produced side branches below the callus proliferations which rooted well. (2) Using an old device, the cambium of a branch was partially laid bare and after treatment with Belvitan a flower pot was put over it containing a mixture of sand, peat, compost soil and sphagnum. With some apple varieties this method was successful in the following year. The peach variety Amsden could also be made to produce roots by employing method (1). Root cuttings of White Transparent apple and Amsden peach 8-10 cm. long, taken in November, were set out in March in a frost-free container, covered with 1 cm. of soil. The peach failed to develop any further, but the apple produced up to 90 cm. long, well rooted shoots. During the first year shoot production from roots was 32%, during the second year 42%. The result for the pear Bartlett was 10%, whilst the response of pear seedlings varied. Seedlings of the apple variety Northern Spy gave excellent results (96%), almost every root cutting becoming fit for budding. Experiments with plums were also included.

495. MORETTINI, A. 634.63-1.533.1
A proposito dei metodi di propagazione dell' olivo. **(A new method of propagating olives suggested.)**
Ital. agric., 1943, **80**: 67-76, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 145-6.

The new method of vegetative propagation of olives consists in injuring the bottom part of old olive stems, thus stimulating the growth of suckers. These rooted suckers are detached and planted up in nurseries until a good root system develops. The method is claimed to make a quick renewal of old plantations possible.

496. HILKENBÄUMER, F.
631.541.11: 634.11 + 634.13 + 634.22 + 634.21 + 634.25
Die gegenseitige Beeinflussung von Unterlage und Edelreis bei den Hauptobstarten im Jugendstadium unter Berücksichtigung verschiedener Standortsverhältnisse. **(The reciprocal influence of stock and scion in the chief fruit types** [apples, pears, plums, apricots and peaches] **in their early stages with special reference to locality.)***
Kühn Arch., 1942, Vol. **58**, pp. 261, bibl. 101.

This contribution from the Halle Institut für Pflanzenbau und Pflanzenzüchtung concerns large-scale trials made at a series of places in that area and two other localities near Bonn and Berlin respectively. The material was provided by well known nurseries and the trees were raised mainly under guidance from Maurer of Berlin Dahlem. The attempt was made to allow 15 or at least 12 trees for each treatment at each locality and this was generally achieved as regards apples and pears. Tables and figures are given without stint and the practical information afforded by these data on early development is tabulated for plums and apples. That for apples concerns some 16 rootstocks, the individual effects of which on tree growth are set out under the following heads:—frost damage, vigour, root formation, anchorage and suckering, initiation of flowering, flowering and cropping. Notes are given on the particular uses indicated for the different stocks. Tests covered some 28 rootstocks for plums, peaches and apricots and tabulated data similar to the above cover the following:—compatibility, frost damage to scion and to rootstock, vigour, suckering, initiation of flowering, flowering, cropping and indicated uses. Only in one case was there evidence of any rootstock effect on disease resistance; M V apple stock, itself susceptible to scab, increased the susceptibility of its scions. Localities were found sometimes to mask stock influence and to even out trees on different stocks. The volume should certainly be in the hands of all workers interested in stock-scion problems, directly it is possible to get copies. It was published and issued by Paul Parey of Berlin.

497. ÖSTLIND, N. 634.11-1.541.11
Om grundstammar för äpple och deras identifiering. **(Apple rootstocks and their identification.)**
Sverig. pomol. Fören. Årsskr., 1943, **44**: 71-9, bibl. 8.

An identification key for East Malling apple rootstocks supported by leaf drawings.

498. HÜLPHERS, A. 634.11-1.541.11
Appleodling på paradisunderlag. **(Apple growing on paradise rootstocks.)**
Fruktodlaren, 1943, Nr. 6, pp. 167-9.

The author recommends that wide use should be made in Sweden of the M IX rootstock for growing late bearing varieties, such as Gravenstein. The advantages of such a policy in the nursery are enumerated and the common belief that dwarfing rootstocks are less hardy than others is repudiated.

499. TRENKLE, R. 634.11-1.541.11-2.111
Beitrag zur Unterlagen- und Stammbildnerfrage. Klarstellungen. **(A note on rootstocks and stem builders.)**
Dtsch. Obstbau, 1942, **57**: 3-9, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 9.

The value of stem builders for better frost resistance is discussed. Frost resistance being genetically determined it is recommended that in future only diploid frost-hardy pear and apple varieties should be used for the production of rootstocks. Special plantations for seed production will be necessary, in which two diploid frost-hardy varieties should be planted together, at the greatest possible distance from undesirable pollinators. In 1926, trees of the variety Rheinischer Winterrambour were planted in three groups: (1) with their own stems (budded at the root collar), (2) double worked on Roter Trier Weinapfel, (3) with stems of the seedling rootstock Roter Trier Weinapfel. The trees were exposed to the severe winters of 1928/29 and 1939/40. In 1941, most total losses were recorded in group (1), followed by (3). Trees with Roter Trier Weinapfel as stem builders had suffered the least frost damage and showed the greatest stem diameter and the best crown development. As long as frost-hardy stem builders are not available which can be propagated vegetatively, nurseries should be encouraged to use intermediate stem builders by offering them higher prices for double worked trees.

500. MCGILLIVRAY, K. D. 634.22-1.541.11
Prune stock trials at Wagga Experiment Farm.
Agric. Gaz. N.S.W., 1943, **54**: 565.7, 570.

The prune rootstock trials at Wagga Experiment Farm, N.S.W., have advanced far enough to indicate the failure of some combinations and to demonstrate the success of

* Translations have been made of the summaries of the different sections and of the chief tables and are available on request from the Bureau.

others. The suitability of a number of rootstocks remains still doubtful. D'Agen on Buck plum and Robe on cherry plum were classed as compatible in this progress report. Disadvantages of the former combination are that the fruit size is small and that Buck plum does not root readily from cuttings. The results of the trial are tabulated.

501. Rigotti, R. 634.25-1.541.11
Un nuovo portainesto del pesco ? *Prunus persica* × *Prunus davidiana*. **(A new peach stock ?** *P. persica* × *P. davidiana*.)
Ital. agric., 1942, **79**: 664-7, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 149.

A cross has been made by Professor Avanzi between the peach variety Moscatella bianca as female parent and *Prunus davidiana*, introduced into Italy from China some 15 years ago. In its third year the hybrid produced 300 well shaped fruits. The flesh was about 1 cm. thick and of a taste similar to Moscatella. Such favourable *P. davidiana* characters as few requirements in respect of soil and climate, early bearing and vigour are reported to have been retained. Plantation on a major scale has been made.

502. Garner, R. J. 634.13-1.541.11
Double-working of pear trees.
Nurseryman and Seedsman, 1944, No. 2582, pp. 31.

An extensive trial at East Malling has shown that good double-worked maidens of Williams [and presumably other pear varieties] can be produced 2 years after planting the rootstock. Five-inch lengths of Beurré Hardy, as intermediate, were whip and tongue grafted in March with a three-bud scion of Williams, sealed and placed upright in a box of peat. Two or three days later the combination was grafted on Malling quince 3 in. above ground level. If fairly moist and cool storage is available, the first graft may be done several weeks before the second, and the work can be carried out under cover during bad weather. The minimum length of the intermediate between the upper lip of the stock and the lower lip of the top scion was 2 in. This method proved superior to others and 97% of saleable trees were secured. A list is given of those varieties which do best when double worked.

Pollination.

503. Lewis, D., and La Cour, L. F. 581.162.3
Collection of pollen and artificial wind pollination.
Nature, 1944, **153**: 167-8, bibl. 2.

A method of pollen collection based on air suction is described from the John Innes Horticultural Institute. The suction is supplied by a household vacuum cleaner with a suitable adaptor for collecting. The adaptor is simply made from a piece of ¼-in. glass tube (the collecting end) fitted through a rubber bung into the top half of a 1-in. glass boiling tube cut into two. Over the other (flanged) end of the boiling tube is stretched a piece of linen or other porous material held taut by a rubber band round the neck of the tube. The whole device fits into the metal end of the vacuum's extension tube. The pollen is sucked through the open end of the collecting tube and retained in the larger tube, in which it can be stored if necessary. In collecting from clusters, e.g. apples, a bell-mouthed tube could be used. Advantages claimed for the method are cleanliness and speed. The device with the air current reversed can be used as a pollinator. In this case a press-button valve releasing staccato puffs of air must be fitted between the fan and the pollen container. The method might well become very useful if artificial pollination had to be resorted to on a large scale.

504. Svolba, F. 581.162.3
Beobachtungen bei Pollenkeimprüfungen. **(Pollen germination tests.)**
Gartenbauwiss., 1942, **17**: 95-105, bibl. 35.

Tests carried out at Vienna University showed that poor pollen germination in a sugar solution containing water from the Vienna main was not due to the presence of Ca-ions, but to the alkali reaction of the water (pH 7·3). Germination was normal when the pH value was reduced to 5·5 by the addition of basic phosphate.

505. Flory, W. S., Jr., and Tomes, M. L. 634.22: 581.162.3
Studies of plum pollen, its appearance and germination.
J. agric. Res., 1943, **67**: 337-58, bibl. 29.

In pollen counts over three seasons the percentage of normal and abortive pollen was determined for 46 plum varieties, including practically all the important commercial and home orchard varieties grown in Texas, as well as for 14 *Prunus* species and one possible hybrid. Germination tests were made of 39 varieties, the size of sample being 1,000 grains. The results presented in 13 tables showed that (1) environmental factors did not influence the percentage of normal pollen in a given variety and (2) that for all varieties together there was a highly significant correlation between percentages of normal pollen and actual germination figures in each year. Hybridity as a cause of pollen sterility is discussed.

Growth and nutrition.

506. Levoshin, V. K. 634.11-1.52
The origin of forms within an apple clone. [Russian.]
Vestnik Plodovo-Jagodnye Kul'tury (*Fruit Crops*), 1940, No. 3, pp. 3-13.

Investigations carried out between 1935-39 in the Saratrev Territory (Lower Volga) showed that among the numerous types of Anise apple grown there a variety described as striped Anise (pink) occurs in many forms occupying, as it were, an intermediate position between the oldest Anise striped (grey) and Anise russet. The author assumed that the polymorphism displayed by the striped pink type was due to the environmental influences that have operated over a number of years. A survey revealed a number of new bud variations on the crown branches of 120-130-year-old trees, which resembled the russet type. Further tests proved that the new apple was superior in taste and keeping quality to those produced by the maternal tree.

507. McCown, M. 634.11: 581.148
Anatomical and chemical aspects of abscission of fruits of the apple.
Bot. Gaz., 1943, **105**: 212-22, bibl. 19.

The processes involved in the formation of the absciss layer in immature and mature pedicels of the apple have been studied at Purdue University, Indiana, over a period of 5 years and are now described and illustrated.

508. Znamenskii, I. E. 634.11-1.84+1.55
The conversion and translocation of nitrogenous substances in the branches of Michurin's apple hybrid, Bellefleur-kitaika, during the growing season. [Russian.]
Trud. bot. Inst. Akad. Nauk., S.S.S.R., Ser. IV, Eksp. Bot., 1940, No. 4, pp. 186-93.

The problem indicated by the title of the article was investigated in two 8-year-old apple trees, which belonged to the variety " Bellefleur-kitaika ", a hybrid of *Malus pumila* and *M. prunifolia*, bred by Michurin. Sampling, in which 1-year-old branches were always taken at 9 a.m. from the same side of each tree, was carried on during the heavy crop year of 1933 from 22 April to 15 June, and again from 15 Sept. to 15 Nov.; and during the unfruitful year of 1934, from 24 April to 28 Nov., twice a month except in October, when three samples were taken. The earliest samples were thus taken when the buds were swelling, and the last when frosts had begun. The presence, in the leaves, bark, buds

and wood, of the total amounts of nitrogen and nitrogen in soluble form of protein and amino acids, was determined at various times during the 24 hours: the earliest at 8 a.m., the latest at 4 a.m. on the following day. It was concluded that there was less nitrogen in the leaves at night than in daytime, and that there was a slight increase of amino acids and soluble nitrogenous substances in the bark during the night; but there were no obvious diurnal changes of a similar kind in the woody parts. About half the nitrogen had been withdrawn when the leaves fell in the autumn. The amount of protein nitrogen was less, and the amounts of soluble nitrogen and amino acids more, in the buds, bark and wood during the spring of 1933, than in that of 1934. Though the author does not venture to draw any definite conclusion from the last observation, he suggests that it is not the absolute amount of nitrogen which determines size of crop but the proportion of protein to soluble nitrogen.

Cultural practice, harvesting, etc.

509. JENSEN, H. 634.1/9
Modern teknik vid växtförädling med träd och buskar. **(Modern methods for the improvement of trees and shrubs.)** [German summary.]
K. LantbrAkad. Tidskr., 1943, **82**: 330-40.

This lecture given before the Royal Agricultural Academy of Sweden in May 1943 discusses methods of shortening the time between sowing and flowering in trees and shrubs. 20,000 apple trees, which were planted by the author in 1931 and tightly wired in 1938, responded immediately to the wiring and bore a rich crop in 1939. The breeding of new varieties by means of chromosome doubling is being attempted in cherries and soft fruit, apart from the well-known Alnarp experiments with apples. The author's studies on forest trees are also reported.

510. CHEAL, W. F. 634.11-1.542
Winter pruning in wartime.
Fruitgrower, 1944, **97**: 65-6.

Wartime pruning with special reference to the Wisbech area is considered. Local conditions produce rank wood-growth, necessitating a wider spacing of branches than in other districts. This thinning should have priority over other pruning operations. Next in importance is the clearing of the leader shoot to one growth where necessary. Tipping leader growth, of Wisbech Bramley for instance, is undesirable. The removal of watershoots from the crutch of the tree can be left to unskilled labour. Beginners find the complexities of spur pruning very difficult. Some suggestions are given for the instruction of such students in the art of "reading a tree".

511. PALMER, R. C., BRITTON, J. E., AND FISHER, D. V.
634.21-1.8+1.542
634.25-1.8+1.542
Soil maintenance and pruning methods for peaches and apricots.
Publ. Summerland exp. Stat. **721**, 1941, pp. 25, bibl. 18, being *Tech. Bull.* 34.

The *soil maintenance* methods for peaches and apricots, compared in this experiment over a 10-year period, consisted in (1) continuous cover cropping with hairy vetch, (2) clean cultivation with an annual application of 10 tons of manure per acre, (3) clean cultivation with an annual application of 600 lb. per acre of a 4-8-12 fertilizer. During the first 6 years' treatment (2) produced by far the largest trees and the heaviest crops, yields over the whole period being in the ratio 5: 4: 3 for treatments (2), (1), (3) respectively. The manurial treatment also gave the highest returns, though closely followed by the cover cropping method. The *pruning* methods employed were (1) long pruning (thinning out without cutting back), (2) short pruning (cutting back shoots to about half their length + thinning out), (3) medium pruning (light cutting back + thinning). During the first 6 years from planting, treatment (1) gave greatly increased yields, especially with peaches. In the last 4 years the trees treated according to (2) and (3) caught up, but did not reach the total yield figure over the whole period of (1) owing to the initial delay in bearing. The vigour of terminal growth after 10 years was greatest in the short-pruned plot. The varieties tested were Elberta, J. H. Hale and Tuscan Cling peach and Blenheim, Tilton and Wenatchee Moorpark apricot. With the exception of Blenheim apricot all varieties responded well to the long pruning treatment.

512. BREGGER, J. T. 634.25-1.87
Recent developments in planting, cultivation and cover crop practices in Southern peach orchards.
Ill. Hort., 1944, **33**: 1: 2.

The adaptation of a terracing principle, recently worked out for tobacco fields in North Carolina, to the planting of peaches is advocated and consists of paralleling the terrace row directly above at points where contour lines converge and the terrace row below where they diverge. The advantages claimed are: Better drainage, less breakage of inter-terrace ridges with little likelihood of exceeding the capacity of the main drainage terrace channels and better distribution of conserved rainfall to all trees. Further points dealt with by the author are: location of the tree with respect to the terrace profile, contour and intensity of cultivation, cover crop selection and management.

513. JORDAN. 634.1/7-1.5
Bodenbearbeitung im Obstbau. Bericht über Versuchs-und Forschungsergebnisse. **(Soil cultivation in orchards. Report on experimental results.)**
Dtsch. Obstbau, 1942, **A57** [sic]: 213-6, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 139.

Clean cultivation of fruit trees gave a considerable increase in yield as compared with sod. There was little difference in results between leaving entirely uncultivated and cultivating only immediately around the trunks. Ploughing 15 cm. deep in winter and cultivating 4-5 times 5 cm. deep during the growing period produced the best results of the cultivation methods tested. The abstract does not indicate which tree fruits were used in the trials.

514. MAPLESTONE, C. 631.87
Composting baled straw.
Gdnrs' Chron., 1944, **115**: 14.

The first step in the composting of baled straw—1 ton or 25 bales is the quantity suggested—consists of spreading the material 1 foot high and soaking it for an hour. A 6-in. layer of straw is then spread over the site (a square measuring 4 yards each way) and soaked thoroughly, after which ½ lb. sulphate of ammonia is spread over the straw. The following layers receive the same treatment with the only exception that to every fourth layer 1 lb. of hydrated lime is applied instead of sulphate of ammonia, the heap being firmly trodden down before the application of the lime. When finished the heap is watered again and covered with straw. Four to six weeks later the heap is turned, a site of 3 yards square sufficing for the final site. In packing the drier material should be put in the centre and watered if necessary. The final heap should be trodden down firmly and covered. After about 6 months the compost will be ready for use. It is considered to be nearly equal to farmyard dung, rather higher in nitrogen, but rather poorer in phosphates and potash. Initial de-nitrification of the soil, frequently occurring after liberal application of composted straw, can be remedied by applying a quick-acting nitrogenous fertilizer, preferably sulphate of ammonia. In a supplementary note by W. J. Moyse (extract from *Warwickshire Farmers' Guide*) slight modifications of the above method are described. This author suggests the composting of 6 tons of straw in one heap yielding 12-15 tons of rotted organic manure.

515. Drew, J. P., and Deasy, D. 631.87
Artificial farmyard manure.
J. Dep. Agric. Éire, 1943, **40**: 252-6.

A technique is described for the production of artificial farmyard manure from straw, resulting in a product only slightly inferior to farmyard manure. The straw which was adequately wetted by immersion in concrete tanks (to secure the proper wetting of the straw is one of the main difficulties) was made into compact heaps of 3 tons each. In the most successful treatment the wetting was done with dilute liquid manure, fresh stable manure was placed between alternate layers of straw at the rate of 10 cwt. per 3 ton heap. The fermenting material, in which the heat rose to 146° F. was trampled during the second week to control the temperature, but without effect. The addition of a very insoluble form of ground phosphate (all that was available) at the rate of 2 cwt. per 3-4 tons raised the total P_2O_5 but owing to its insolubility it does not follow that its incorporation rendered the phosphates more available as plant food. Decomposition was retarded on the top and sides of the heap through drying and it is suggested that the composting be done in the early winter months or that the heaps be surrounded by an improvised wall of clay or by some more permanent structure. Typical analyses are as follows: Straw+water+stable manure N 0·31%, P_2O_5 0·16%, K_2O 0·31%, straw+liquid manure+stable manure N 0·34%, P_2O_5 0·17%, K_2O 0·61%.

516. Clark, C. C. 631.67: 634.1/2
A grower's experience with irrigation.
Proc. Wash. St. hort. Ass., 39th annu. Meet. 1943, 1944, pp. 27-9.
Worthen, C. T.
Adequate irrigation for orchards.
Ibidem, pp. 29-30.
Clore, W. J.
What are the effects of over-irrigation of orchards ?
Ibidem, pp. 30-1.

The practical experience of two growers on orchard irrigation is followed by advice from the Irrigation Branch Experiment Station, Prosser, on the dangers of excessive irrigation.

517. Hancock, W. G. 634.1/7-1.67
Notes on farm and orchard irrigation.
Qd agric. J., 1943, **57**: 337-43.

The principles of water application and usage are explained and attention is drawn to a number of practical points in the irrigation of Queensland farms and orchards.

518. Cocker, H. R. 631.67
Subsoil irrigation.
Gdnrs' Chron., 1944, **115**: 118.

A method of subsoil irrigation is described, which has recently been introduced in Madras, India, with great success. Earthenware pipe lines 30-40 feet long, 3 inches in diameter, are laid in sections about 12 inches below the surface. The pipe sections are laid end to end with ½ inch gaps in between, which will allow water to seep into the soil. A each end of the pipe line vertical sections are introduced, into which the water is poured. The latter are also valuable for inspection purposes and for the prevention of air locks. The distance between pipe lines recommended is 6-8 feet. Subsoil irrigation, which is specially suitable for sands and loamy soils, is claimed to achieve considerable economy in labour and water and to increase the yield. The author envisages an employment of this method for application of liquid manure or fertilizers in solution.

519. Kuanyšgaliev, A. B. 634.1/8-1.67
Irrigation in orchards of the Alma-Ata foothills.
[Russian.]
Bjull. Kazah. Naučno-issled. Inst. Zemled. im Akad., V.R. Viljjamas, 1940, No. 1-2, pp. 2-6.

The rainfall in the Alma-Ata region is about 535 mm. a year. Most of it occurs during the autumn, winter and early spring, and but very little when the trees need it most. Irrigation is therefore necessary. The more common method of irrigation is by flooding which, though quicker, is more superficial than the furrow method. Furrows, which should be about 120 cm. apart and not more than 150 to 200 m. long, ensure a more thorough soaking of the soil and a more economic utilization of water than does flooding. The water flows more slowly, and an experiment was carried out which showed that irrigation lasting 18 hours resulted in deeper lateral penetration than one lasting shorter periods. Another experiment with apple trees 8 or 9 years old, during an unusually dry season, showed that irrigation in late autumn, when the leaves were yellowing and again in summer, was sufficient to ensure a normal growth and yield. Irrigation in late autumn provides the roots with an available supply of water not only in spring but also during the winter, when the trees in these parts may suffer from insufficient water.

520. Javaraya, H. C. 634.11-1.589
Bi-annual cropping of apple in Bangalore.
Ind. J. Hort., 1943, **1**: 31-4.

The method by which apples in Mysore State are made regularly to produce two crops in 12-15 months is described. The apple country lies between latitudes 12° N. and 15° N. at 3,000 ft. above sea level. The climate is mild and free from extremes. An essential feature of the cultivation is the inducing of a rest season by artificial means during January or February and again in August or September when the trees are not very active. Of the 70 varieties tried Rome Beauty responds best to the treatment, though Glengyle Red, Cleopatra, Jonathan, Cox's Orange and Ribston Pippin do fairly well. After 3 years of regulated growth in the field the first wintering or drying off is given. Irrigation, given weekly in the dry season, is withheld for a fortnight. Towards the end of this period the soil around the stem is removed to a depth of 6 inches and to a width corresponding to the spread of the roots. Dead, injured or diseased roots and root suckers are cut off. The leaves wilt and drop within 2 days, those which persist being stripped from the plant by running the hand round the shoots from the top downwards. Three days after uncovering the roots are covered with a layer of sand and the excavation refilled with a compost of powdered sheep manure, red earth and sand, 3-2-1. Failing sheep manure the following artificials are used in mixture: ammonium sulphate 2 parts, bone meal, sulphur phosphate and potassium sulphate one part each, the amount applied increasing with the size of the trees. A copious irrigation is given at once and twice weekly thereafter. The trees flower within a fortnight and the crop is ready for picking in the 5th or 6th month. The fruit is severely thinned and each apple is supported by criss-cross strips of plantain fibre passed under it and attached to the nearest strong shoot. As harvest approaches, water is gradually withheld. A 4-year-old tree will bear up to 60 fruits, a 6- to 9-year tree about 12 dozen. The trees, owing to gradual deterioration, are not profitable after their twelfth year. Woolly aphis which destroyed the industry at one time (1897-1908) has been overcome by the use of Northern Spy stock. Root-rot, however, is becoming a problem, especially with Rome Beauty.

521. Leonard, R. H., and Dustman, R. B.
634.11: 581.192
Sugars in relation to color and thiocyanate spray in apples.
Plant Physiol., 1943, **18**: 488-97, bibl. 9.

A study of the sugars in apples subjected to sodium thiocyanate spray to increase colour was undertaken at the West Virginia Experiment Station as a first step in an investigation into the chemical changes occurring in sprayed fruit and the relationships of anthocyanins to other constituents. Spraying with sodium thiocyanate reduced dry matter, sucrose, titratable acidity and possibly the levulose,

and increased pH value. It reduced titratable acidity and increased pH value of the peels but did not affect their other constituents. Thiocyanate spray is effective in part by penetration beneath the skin of the apple and by the resulting action upon layers of tissue immediately beneath the skin. It was found that the relative proportion of dextrose, levulose and sucrose determined by alcoholic extraction of apple tissue may not be identical with those removed by pressing and determined in the juice. Spraying caused a lowering of sugar content at time of harvest. After 4 months in storage the sprayed fruit contained more sugar than the unsprayed. This may account for the superior keeping quality of sprayed fruits, again confirmed in these studies.

522. WHITTAKER, E. C., AND MACKENZIE, P. B. 577.15.04: 634.1/2-1.55
The control of pre-harvest drop of apples and pears.
Agric. Gaz. N.S.W., 1944, **55**: 11-3.

The control of pre-harvest drop of apples and pears by spraying with naphthaleneacetic acid at a concentration of ·001% was studied at the New England Experiment Farm, Bathurst Experiment Farm and private orchards at Orange and Batlow, New South Wales. The best time to apply the hormone was when the first maturing fruits were observed to fall. The effectiveness will then usually continue over the normal picking period. For McIntosh a second application, 7-10 days after the first, is recommended. Williams' Bon Chrétien pear responded particularly well to the treatment with a drop of 4·1% after 24 days as against 16·1 in the checks. It was found that pears gave a better response than apples, which may be due to the larger absorption area of their fruit stalks. In Jonathan apple the drop was reduced from 24·61% to 11·36% after 28 days and on Delicious from 47·1% to 35·2% after 31 days. In Jonathan no effect was noticeable up to the 7th day. The trees did not seem to be affected by the treatment.

523. KRUMBHOLZ, G., AND WOLODKEWITSCH, N. 634.1-1.547.6
Festigkeitsmessungen an Früchten und ihre Anwendungsmöglichkeiten. I. Mitteilung: Die Bestimmung der Fruchtfleischfestigkeit. **(Pressure testers for measuring fruit maturity.)**
Gartenbauwiss., 1943, **17**: 543-90, bibl. 43.

The methods used for determining fruit pressure are discussed in great detail and the results of such determinations with a number of pear and apple varieties at different stages of maturity are given.

524. NILSSON, G. 634.1/2-1.536: 632.944
Hur fylla luckorna i fruktträdgården. **(How to fill gaps in the orchard.)**
Fruktodlaren, 1943, Nr. 6, pp. 171-2.

In experiments conducted at the Agricultural College, Copenhagen, the following soil treatment of gaps in orchards before planting gave the best results: 10 cm. deep holes at a distance of 25 cm. from each other are made within a square metre marked out at the place where the tree will be re-planted and about 20 g. of carbon disulphide are applied to each hole. The fumes are heavy and penetrate well into the soil.

525. TUKER, G. 634.11-1.538
When it pays to start grubbing your trees.
Mkt Gr., 1944, **22**: 6: 11.

While Worcesters may stand for a year or two without much loss of crop after the branches of adjoining trees have met, Cox's will soon decline in total crop weight and the fruit will be of low grade. A striking example of increased total crop as a result of tree thinning is given. It is suggested that if Cox's are planted at 15×15 ft. the trees will stand 10-12 years before any grubbing becomes necessary and in that time should yield from 6½ to 12 bushels. Worcesters at the same planting distance will give 13 to 23 bushels before any tree removal is needed. Grubbing by tractor is a better method than by monkey winch or steam engine. Two tractors are better than one, and the simplest way of working them in combination to pull 30 trees per hour is described.

526. LUNDIN, Y. 634.1/7-1.55
Skördeutfallet hos fruktträden 1942. **(Yields of fruit trees in 1942.)**
Sverig. pomol. Fören. Årsskr., 1943, **44**: 166-9.

Details are given in respect of the Swedish fruit harvest in 1942 of the number of reports received, number of apple, pear, plum and cherry trees, total yield, average yield per tree in 1942 and 1941. In further tables particular data are given for certain apple, pear and plum varieties.

527. LLOYD, J. W., AND EKSTROM, V. A. 658.8: 634.11
Marketing the Illinois apple crop. Present practices and historical review.
Bull. Ill. agric. Exp. Stat. **497**, 1943, pp. 497-547.

The bulletin covers the development in the methods of marketing Illinois apples during the last 50 years, but the stress is laid on the description of present practices in that State. From the abundance of data presented only a few can be mentioned: in Illinois apple production is concentrated in well-defined commercial areas and confined to a few well-known varieties, of which Delicious and Golden Delicious fetch the highest prices. A large proportion of the apples marketed in packages are of No. 1 grade. Better orchard management, it is suggested, would reduce the percentage of culls.

Noted.

528. ANON. 634/635(493)
Horticulture in Belgium as affected by the war.
Int. Rev. Agric. Rome (*Mon. Bull. agric. Sci. Pract.*), 1942, **33**: 353T-7T.

RUYS, J. D. 634/635(492)
Horticulture in the Netherlands as affected by the war.
Int. Rev. Agric. Rome (*Mon. Bull. agric. Sci. Pract.*), 1942, **33**: 357T-60T.

SONESSON, N. 634/635(485)
Horticulture in Sweden.
Int. Rev. Agric. Rome (*Mon. Bull. agric. Sci. Pract.*), 1942, **33**: 360T-2T.

KEMMER, E. 634.1/8(43)
Wesen und Erscheinung des Obstbaues in der Bauernwirtschaft. **(German peasant fruit farming.)**
Dtsch. Obstbau, 1943, **58**: 21-3, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 149.

Most of commercial fruit so grown.

ENGSTEDT, G. 634.1/7(43)
Den tyska fruktodlingens problem och egenart. Några lakttagelser och reflexioner. **(The character of German fruit growing and its problems. Observations and reflexions.)**
Sverig. pomol. Fören. Årsskr., 1943, **44**: 149-65.

HILDEBRANDT, B. 634.11-1.521(43)
Apfelsorten im deutschen Nordosten. **(Apple varieties in North-East Germany.)**
Dtsch. Obstbau, 1943, **58**: 63-5, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 147.

ARGENTINA. MINISTRY OF AGRICULTURE. 634.1/8: 382.6
Disposiciones reglamentarias referentes a la exportacion de frutas frescas. **(Export regulations with regard to fresh fruit in Argentina.)**
Bol. Frut. Hort. B. Aires, 1942, Vol. 7, No. 83, pp. 30.

WALSH, T. J. 634.11: 663.3
Cider orchard development in South Tipperary.
J. Dep. Agric. Éire, 1943, **40**: 257-66.

SÖRLIN, A. 631.4: 634.1/7
De minerogena jordslagen som växtgrund med särskild hänsyn till fruktodlingen. En orientering. **(A survey of soil types and their possible influence on fruitgrowing.)**
Sverig. pomol. Fören. Årsskr., 1943, **44**: 17-44, bibl. 13.

MUGUERZA, A. 634.63-1.532/535
El olivo, sus diversas formas de multiplicacion. **(Various ways of propagating the olive.)**
Bol. Fom. rur. B. Aires, 1940, Vol. **5**, No. 62, pp. 7, reprinted *ibidem*, 1942, **7**: 74: 19-22.
See *H.A.*, 14: 46.

ARGENTINA, MINISTRY OF AGRICULTURE. 634.63: 351.823.1
Ley No. 11.643 de fomento de la olivicultura. **(Olive growing regulations in Argentina.)**
Bol. Fom. rur. B. Aires, 1941, Vol. **6**, No. 51, pp. 16, bibl. 4, reprinted *ibidem*, 1942, Vol. **7**: 74: 1-16.

SMALL FRUITS, VINES AND NUTS.

529. KACEÏKO, A. N. 634.7-1.67
Furrow irrigation of small fruits. [Russian.]
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljjamas, 1940, No. 7-8, pp. 29-32.
Experiments were carried out in order to compare the effectiveness of irrigating a strawberry crop by means of furrows and by means of flooding. The former method was shown to be superior; the penetration of moisture was deeper, and the moisture content of the soil greater. The moisture content was determined by a method which is not described, involving the use of alcohol. It was devised at the Kazah Agricultural Institute.

530. SYDENHAM, F. 634.7: 577.16
Cultivation of the Chinese gooseberry.
N.Z. J. Agric., 1944, **68**: 111-3.
Actinidia chinensis, the Chinese gooseberry is a dioecious, deciduous fruiting climber, native to forest margins in China. In cultivation care should be taken to secure a good strain in which the fruit is an elongated oval and green fleshed with an entire absence of internal fibrous or woody material. The plant grows readily from seed and most seedling strains are inferior. A good strain can be propagated by root grafting onto a female root piece, preferably of the same strain. Seedling stocks are not recommended as they are apt to break into growth below the union and should they prove to be male both sexes would occur on the same plant, which is considered undesirable except in small plantings. Male and female plants should be kept separate, the proportion in the plantation being 1 m. to 5-10 f. To avoid mistakes it is recommended that the females should be whip and tongue grafted and the males cleft grafted. The two types of graft are distinguishable for several years. The plant is grown in commerce on strong wire fences 5 ft. high with 3 strands, the lowest 18 in. from the ground. The lines are 10 ft. apart and the spacing between plants in the rows is 12 ft. to 20 ft. It is preferable to grow one row of males to 5 rows of females, the males may be 30 to 40 ft. apart and will still furnish the fence completely. Some shelter from wind is required and, if not available otherwise, may be provided by a surround of male plants trained to an appropriate height. In small plantations a male may be grafted low down on every fifth female and trained on the bottom wire, being specifically marked since males are pruned differently. In training and pruning the bottom wires should be furnished first. The first 2 years the tips of the laterals are removed as they reach 12 in. Much attention in training is needed until the plants come into fruit after the 3rd year. Growth in the female plants is then greatly retarded but the males continue to be vigorous, hence the preference for separate planting. The fruit develops as in the vine on new shoots from dormant buds. Vigorous non-fruiting growths, except when required for fruiting wood or leaders, should be cut back or removed, otherwise possibly many fruiting laterals below will die from excess shade. On fruiting shoots vigorous growth may be stopped several leaves above the last fruit, less vigorous fruiting shoots can be left alone. Fruiting wood must be considerably thinned out in winter as is the spur and lateral wood of apple trees. It is not cut back to rods as in grapes. Correct pruning has much influence on fruit size. The manurial treatment recommended for heavy bearing plantations is 6 lb. of blood and bone per plant in late winter and 1 lb. sulphate of ammonia or dried blood per plant at flowering time. The profitable life of the vine is about 20 years. Yield is unrecorded, but a plant at Tauranga, N. Zealand, produced 200 lb. in its fifth year. In New Zealand, N. Island, the vines bloom in November, complete their growth by May, the fruit is high in pectin and fit for preserving in June; it begins to ripen and to lose pectin in July when it becomes a dessert crop. It should be stored in a cool chamber and marketed before it becomes soft. There are no records of pests or diseases in N.Z., but birds eat the ripe fruit.

531. SKIPWITH, R. G. 634.725: 577.16
The commercial culture of Cape gooseberries.
Rhod. agric. J., 1944, **41**: 20-2.
An account of a new venture in the growing of Cape gooseberry, *Physalis peruviana edulis*, in the Eastern District of Southern Rhodesia. The crop will grow anywhere where tomatoes will do, but must be picked before the first frosts. Propagation is by seed sown at fortnightly intervals in nursery beds from September to November, from ½ to 1 oz. of seed being required per transplanted acre. The spacing in the field recommended for a start is 4½ × 4½ ft. or 2,150 plants per acre. The method of planting with native labour is described. Light dressings of fertilizer are given in the seedbed and in the field shortly after transplanting. The soil must be kept free from weeds and well aerated by frequent cultivation. In the present instance a single ox pulling a seven-tine spring-tooth cultivator is used as often as possible. The yield obtained is 1 to 1½ tons of berries per acre. Girls are the best pickers, picking at the peak 2½ bushels a day and at the beginning or end of the season ½ bushel per day of hulled berries. Contracts demand ripe fruit in sound condition. The fruit is picked over on a tray 12 ft. × 3 ft. with a rim of 3 in. and holding 1 bushel. In addition the pickers' baskets are constantly examined. Cash is paid as every half-bushel is brought to the grading table. Although fresh plantings should be made annually, the author finds it necessary to ratoon half his acreage. The result of this is an increase of pests and diseases in the ratooned patch, a reduction of fruit quality and in picking having to be done during the rains. Plants for ratooning are cut back hard at the end of the season. Locusts do not eat the crop. Red spider can be controlled by spraying with lime-sulphur ½ gal., colloidal sulphur 2 lb., water 100 gal. or sulphur dusting at the rate of 75 to 100 lb. per acre. The dusting necessitates the use of goggles.

532. EATON, E. L., AND OTHERS. 634.73
The blueberry.
Publ. Canada Dep. Agric. **754**, 1943, pp. 30, bibl. 12, being *Fmrs' Bull.* **120**.
A well illustrated bulletin on all aspects of blueberry culture in Canada in four sections.

(I) EATON, E. L.
Blueberry culture, pp. 5-16.
The position is reviewed by provinces and the growing both of low-bush and high-bush blueberry is described.

(II) EIDT, C. C.
Blueberry propagation, pp. 17-24.
Both seed propagation and propagation by cuttings are covered.

(III) PICKETT, A. D.
Blueberry insects and their control, pp. 25-7.
Blueberry maggot (*Rhagoletis pomonella*), the currant fruit weevil (*Pseudanthonomus validus*), and the chain-spotted geometer (*Cingilia catenaria*) are dealt with, such insects of less economic importance as the blueberry leaf beetle (*Galerucella vaccinii*), the blueberry flea beetle (*Altica torquata*) and the autumn webworm (*Hyphantria cunea*) receiving only brief treatment.

(IV) HOCKEY, J. F.
Blueberry diseases and their control, pp. 29-30.
Remarks on red leaf spot, mildew, witches' broom, fruit rot and susceptibility to drought and dust injury.

533. DARROW, G. M. 634.75-1.524
The Midland and Fairpeake strawberries.
Circ. U.S. Dep. Agric. **694**, 1944, pp. 4.
Two new strawberry varieties introduced into Maryland. Midland is described as early with large fruits of above-average dessert and shipping qualities. Fairpeake is said to be a sweet, high-flavoured, garden and general market late variety of great beauty.

534. BROWN, S. W. 634.715
The origin and nature of variability in the Pacific Coast blackberries (*Rubus ursinus* Cham. and Schlecht. and *R. lemurum* sp. nov.).
Amer. J. Bot., 1944, **30**: 686-97, bibl. 27.

ROBERTS, R. H., AND STRUCKMEYER, B. E. 634.76: 581.145
Blossom induction of the cranberry.
Plant Physiol., 1943, **18**: 534-6, bibl. 4.

BURKHART, L. 634.75
Firmness of strawberries as measured by a penetrometer.
Plant Physiol., 1943, **18**: 693-8, bibl. 14.

ARGENTINA, MINISTRY OF AGRICULTURE. 638.2: 634.36
La cria del gusano de seda y cultivo de la morera. **(Practical instructions for raising silkworms and cultivating the mulberry.)**
Publ. misc. Minist. Agric. B. Aires **120**, 1942, pp. 17.

535. LARMAT, L. 663.25 + 634.8(44)
Atlas de la France vinicole. Les vins de Bordeaux. **(Atlas of wine growing France. The wines of Bordeaux.)**
Paris, 1941, 8 maps, frs. 250, from review *Int. Rev. Agric. Rome* (*Mon. Bull. agric. Sci. Pract.*), 1942, **33**: 385T-6T.
A delimitation of the different wine districts for the production of vintage wines and brandies embodying geological, oenological and agronomic information. The album is to be followed by maps of all the wine growing regions of France.

536. AMERINE, M. A., AND WINKLER, A. J. 634.8: 663.25
Grape varieties for wine production.
Circ. Calif. agric. Exp. Stat. **356**, 1943, pp. 1-15.
The factors influencing the choice of varieties, the climatic regions of California suitable for wine production, and the varieties recommended for each region are indicated. These varieties are briefly discussed. Limited recommendations are also given for an additional number of varieties that have not been fully tested. A.J.W.

537. TLEUZ, G. I. 634.8-1.535
The propagation of vines by means of short cuttings having one or two buds each. [Russian.]
Bjull. Kazah. Naučno-issled Inst. Zemled. im. Akad. V.R. Viljjamas, 1940, No. 7-8, pp. 22-9.
According to this method, calculated to make the fullest possible use of material for propagation when there is little of it, vine shoots are cut into short lengths, each having one or two buds only. The formation of a callus is encouraged by slightly wounding one end of each cutting in a manner described by the author, planting the cuttings in damp sand, and keeping them in a glasshouse or frame until they have struck root. They are then planted outside. An experiment showed that cuttings having two buds, when planted vertically give rise to better vines than those with single buds planted either vertically or horizontally.

538. MEIER, K. 634.8-1.4 + 1.8
Boden und Düngung im Weinbau. **(Soil and manuring in viticulture.)**
Flugschr. Eidg. Versuchsanst. Obst- Wein-u. Gartenb., Wädenswil **46**, 1943, from *Schweiz. Z. Obst-u. Weinb.*, 1943, **52**: 97-116.
Detailed information on soil cultivation and manuring in the vineyard under Swiss conditions, preceded by a discussion on general principles.

539. SCHRADER, T. 634.8-1.8
Der Nährstoffentzug der Reben und seine Beziehungen zu Düngung und Nährstoffvorrat des Bodens. **(The nutrient requirements of vines and their relation to manuring and soil nutrient reserves.)**
Wein u. Rebe, 1942, **24**: 1-15, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 3.
Long term investigations conducted at Trier showed that the nutrient requirements of vines are materially lower than those of other agricultural crops. Despite mineral fertilizer applications in large amounts yields decreased in the course of the years 1933-40, but were maintained by applying humus. With an application of stable manure at the usual rate of 400-600 cwt. per hectare the chief nutrients accumulated in the soil. The decrease in yield in the fertilizer-only plots cannot have been caused by nutrient deficiencies, but fertility apparently is favourably influenced by heavy application of humus. It is thought that stable manure applied at the usual high rate does not provide a satisfactory solution of the humus supply for vines. Instead, the substitution of stable manure by an increased application of green manure is suggested.

540. SCOTT, L. E. 634.8: 546.27: 631.811.9
Boron nutrition of the grape.
Soil Sci., 1944, **57**: 55-65, bibl. 11.
At the South Carolina Experiment Station in a vineyard on poor sandy ground abnormal growth and fruiting of vines was corrected by the application of borax to the soil at the rate of 10 lb. per acre. The foliar boron deficiency symptoms would develop early in the season at the time of development of the blossom clusters. The latter seldom set fruit, even when little evidence of deficiency symptoms appeared on the leaves. After failure to set fruit the cane usually resumed normal growth. Boron-deficient vines sometimes set parthenocarpic or seedless fruit. Borax greatly increased fruit set on self-sterile or reflex-stamen varieties, and increased boron content of the leaves.

541. GUKASJJAN, A. S. 634.8
Cultivating the vine without irrigation in the highlands of southern Kazahstan. [Russian.]
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljjamas, 1940, No. 1-2, pp. 6-10.
If the rainfall is not less than 400 mm. a year, vines may be grown in southern Kazahstan provided the appropriate

measures are taken in such matters as choice of site, planting, and moisture conservation. The experiments described in this article were carried out to elucidate the problems connected with those requirements. Among the conclusions drawn from them were that mulching with freshly cut grass and planting at a depth of 1 metre or more were effective.

542. Burvill, G. H., Teakle, L. J. H., and Jones, L. T. 634.8-1.432
Soil moisture conservation in vineyards and orchards. Its relation to cultivation, cover crops, and weeds.
J. Dep. Agric. W. Aust., 1943, **20**: 224-36.
Tests of various cultural and mulching treatments carried out in orchards at Upper Swan and in a number of Swan vineyards confirmed the validity of recent American investigations under Western Australian conditions. The main points are that summer cultivation does not help to preserve soil moisture, that cover crops must be disced (not ploughed) in by mid-September and that moisture loss through weeds must be controlled by subsequent discings. No benefit was derived from straw or similar mulching.

543. Pirovano, A. 634.8: 575
Origini della vite e possibilità di raggruppamenti continentali. **(The origin of the vine and the possibility of forming continental groups.)**
Ital. agric., 1943, **80**: 61-5, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 160.

Engels, O. 634.8-1.4
Kalkzustand und Nährstoffgehalt pfälzischer Weinbergböden. Untersuchungsergebnis 1941. **(The lime- and nutrient-content of vine soils in the Palatinate, 1941 results.)**
Wein u. Rebe, 1941, **24**: 165-76, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 74-5.

544. Kalmykov, S. S. 634.51: 581.162.3
The productivity and flowering of the walnut. [Russian.]
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljiamas, 1940, No. 3-4, pp. 23-5.
Most of the walnut trees in Kazahstan occur in southern Kirgizija where they are found growing, almost without a break, over an area of about 40,000 hectares. In the Bostandyk district of southern Kazahstan some 125,000 wild trees are growing on an area of 1,570 hectares. The quality of the nuts from this particular district is not only outstanding in the whole vicinity but compares favourably with that of walnuts in France, for the nuts contain 72% of oil and 24% proteins. The yields, however, are poor, the average per tree varying between 2 and 5 kg., only individual trees producing as much as 60 kg. Such yields from trees up to 30 metres high cannot be compared with those obtained in Europe or California, where averages of 50 to 60 kg. per tree a year, or even 500 kg. are produced. Though lack of care and the ravages of pests and diseases account for some of the poor yields, failure of coincidence between the flowering periods of the male and female flowers is believed to be the chief cause, as is shown by investigations on 44 trees. These trials allowed the trees to be classified as follows:—(1) In 27·3% of them, the flowering periods of the male and female flowers did not coincide, and the average yield per tree amounted to 2·36 kg.; (2) in 59·6% of them the coincidence was partial, and the yield was 4·50 kg.; and (3) in 13·6% it was complete, and the yield was 9·80 kg. To ensure a larger measure of pollination the author recommends that branches which will bear flowers producing pollen at the required time should be topworked.

545. Meier, K: 634.51
Förderung des Anbaues von Walnüssen. **(The encouragement of walnut culture.)**
Schweiz. Z. Obst-u. Weinb., 1943, **52**: 643-60, bibl. 20.
A programme for the promotion of walnut growing in Switzerland.

546. McWhorter, O. T. 634.5-1.542
Pruning nut trees.
Proc. Western Nut Growers Ass. 28th annu. Meet. 1942, 1943, p. 157.
In the author's opinion walnuts hardly need pruning except when very young, when corrective cutting is necessary. Bearing filbert trees up to 15-18 years also need very little pruning, exceptions being where ease of cultivation and harvesting demand the removal of limbs. Very young trees may need trimming.

PLANT PROTECTION OF DECIDUOUS FRUITS.

547. American Phytopathological Society. 634/5: 632.3/4 + 632.8/9
Abstracts of papers accepted for presentation at the 35th annual meeting of the Society, Columbus, Ohio, Dec. 4 to 6, 1943.
Phytopathology, 1943, **33**: 1109-21.
Abstracts are given of 55 and notes of 3 papers. A number concern spray chemistry and technique. Among others the following in particular concern points of interest to horticulturists.

Allen, T. C., and others.
Blossom drop of wax beans reduced by growth substances.

Gries, G. A.
The effect of plant decomposition products on root diseases.

Gries, G. A.
Juglone (5-hydroxy-1, 4-naphthoquinone)—A promising fungicide.

Hart, J. E. M., and other.
Boron soil treatments and the development of flax diseases.

Hildebrand, E. M.
Fire blight control by prevention of infection. (Title only.)

Howard, F. L., and other.
Cationic phenyl mercury compounds as specific apple scab eradicants on foliage.

Keitt, G. W., and other.
Adaptation of protectant spray programs to follow eradicant ground spraying for apple scab control.

Keitt, G. W., and other.
The spray program for cherry leaf spot in relation to epidemiology, control, host injury and fruit size.

Lyle, J. A., and other.
Fermate offers promise in the control of frog-eye leaf spot (*Sphaeropsis malorum*) of apple.

Palmiter, D. H.
An eradicant treatment for sooty blotch of pears.

Porter, R. P.
Use of a ferric dimethyldithio carbamate and talc dust to combat the *Phomopsis* blight of eggplant.

Sharvelle, E. G.
The incidence of apple scab and cedar rust on Wealthy apples and their effect on fruit development in Minnesota.

SHARVELLE, E. G., AND OTHER.
Cultural variation in single ascospore isolates of *Sclerotinia fructicola* (Wint.) Rehm from cherry plum hybrids.

STODDARD, E. M., AND OTHER.
The coverage effect of sulphur on the control of apple scab.

TAYLOR, C. F., AND OTHERS.
Fermate for control of early blight on tomato.

WILSON, E. E.
The chlorophenates as eradicant sprays against *Sclerotinia laxa* and *Coryneum beijerinckii*.

WILSON, J. D.
Control of tomato anthracnose.

548. AHLBERG, O., LIHNELL, D., AND WAHLIN, B. J. O. 632.1/8: 634.1/7 + 635.1/7
Nyare undersökningar över sjukdomar och skadedjur på fruktträd, bärbuskar och köksväxter. **(Recent research on diseases and pests of fruit trees, small fruit and vegetables.)**
Sverig. pomol. Fören. Årsskr., 1943, **44**: 99-112, bibl. 23.

The majority of the papers dealt with in this review, which is not representative of the literature published outside Scandinavia, have been abstracted elsewhere in *Horticultural Abstracts*. Under the heading *summer spraying with carbolineum* 2 Swedish and 1 Norwegian investigations are discussed which for various reasons are not very encouraging in respect of the use of carbolineum for summer spraying. A number of *new spray mixtures for fruit trees* were tested in Denmark by C. Stapel and H. I. Petersen (*Tidsskr. Planteavl*, 1943, 47). The mixtures, part of which are produced commercially, were applied for the control of apple scab and also of potato blight in the case of copper-containing agents. It has been proved by the Danish plant pathologist N. F. Buchwald (*Tidsskr. Planteavl.*, 1943, 47: 521-38) that brown rot of hazel nuts is caused by *Sclerotinia fructigena*. Life history and control of a couple of black currant midges, *Dasyneura ribis* and *D. tetensi*, are described by the Finnish author N. A. Vappula (*Ann. Entom. Fenn.*, 1941, p. 112). The damping off of horse beans, studied in Germany by H. Schultze (*Zentralbl. Bakt.*, Abt. 2, 1943, 106: 38-50) is reported to occur in two distinct forms. The symptom of the first form, in which the roots continue to function till the death of the plant, is the browning of the vascular bundles caused by the infection of a fungus (not specified in the review). The second form is characterized as a root rot. Among the fungi present in the root *Rhizoctonia solani* was found to be the primary cause of the disease in the majority of cases. *Fusarium avenaceum* and two *Pythium* species, though the first named can also cause primary infection, usually accompany *Rhizoctonia* and aggravate the disease. Naphthalene, paraffin emulsion, fruit tree carbolineum and sublimate were tested in carrot fly control experiments by A. Körting, Berlin-Dahlem (*Mitt. Biol. Reichsanst. Land-u. Forstw.*, 1941, H.64, p. 43). 45 g. naphthalene per m_2 reduced an incidence of 36% in untreated plots to 4% without producing a bad flavour in the carrots, as did higher concentrations of the agents applied. Various fertilizer and liming treatments had no effect, but very early or very late sowings helped to control the pest.

549. HADORN, C., WIESMANN, R., AND MENZEL, R. 634.8-2.4/9
Konferenz über Bekämpfung von Krankheiten und Schädlingen im Weinbau. **(Conference on disease and pest control in viticulture.)**
Schweiz. Z. Obst-u. Weinb., 1943, **52**: 1-21, 25-42, 54-69, 79-93, 117-31.

The following 5 papers were delivered at a conference held by the Wädenswil Experiment Station in December 1942.

(1) HADORN, C.
Vergleichende Versuche im Jahre 1942 über Kupfersparmöglichkeiten im Weinbau. **(Tests carried out in 1942 on economising in the use of copper in viticulture)**, pp. 1-21.

As a result of large-scale tests carried out at Wädenswil in 1942 it was possible to recommend 3 sprays which combine a considerable saving in copper with preservation or even increase of protective effect:—(1) Kupfer-Sandoz in a concentration of 0·5% was equal to a 2% bordeaux mixture and a 0·3% solution was sufficient for practical purposes, meaning a saving of copper of 40% as compared with a 1% bordeaux mixture. (2) A combination of 0·5% Pomarsol + 0·2 Kupfer-Sandoz had the effect of a 2% bordeaux mixture, thus saving 80% of copper. (3) A mixture of 0·5% Pomarsol + 0·4% bordeaux had similar qualities to those of (2) though the duration of its effect was somewhat shorter and its preparation more laborious. The copper saved amounted to 70-80%.

(2) WIESMANN, R.
Neue Versuche über die Bekämpfung der Kräuselmilben. **(New experiments on the control of vine mites)**, pp. 25-42.

Extensive tests with the aim of finding sulphur-saving substitutes for the control of vine mites, *Phyllocoptes vitis* and *Epitrimerus vitis*, hitherto treated by painting the vines with a 10-15% lime-sulphur solution, resulted in the following recommendations: safe control can be obtained by spraying with 5% fruit tree carbolinium, 6% proprietary fruit tree spray mixtures, 1·5% dinitro-o-cresol and a 2·5 lime-sulphur solution (32° Bé) + 0·2% spreader. The first three will also control blister mite (*Eriophyes vitis*), *Phenacoccus aceris* and *Pulvinaria betulae*, but not red spider. The whole vine should be treated for mites and not only the transition from the old to the new wood. The mites and their damage are described.

(3) HADORN, C.
Vergleichender Wirksamkeit verschiedener Spritzbrühen gegen den falschen Rebenmehltau. **(Relative efficacy of different spray mixtures against downy mildew of vines)**, pp. 54-69.

A number of new and old spray formulas and local mixtures were tested with the aim of preventing wastage and, if possible, finding new ways of economizing. The following recommendations emerged from the trials:—(1) The addition of lime-sulphur to bordeaux mixture is deleterious—not beneficial as popular belief will have it—and constitutes a waste of both materials. (2) It is essential to mix copper sulphate and hydrate of lime accurately in the proportion 2: 1 in preparing bordeaux mixture. (3) With the exception of Pomarsol and 2317 W, none of the substitutes tested was both copper-saving and effective. (4) Dusting with preparations containing copper or sulphur is a waste.

(4) MENZEL, R.
Neue Untersuchungen an der Reblaus. **(New phylloxera investigations)**, pp. 79-93, bibl. 16.

A progress report for 1942 on phylloxera research carried out in various districts of north-west Switzerland. Spraying tests with 4½% Veralin, 6% Veralin VI, 1½% dinitro-o-cresol with 4% lysol seemed to indicate that incidence of leaf galls may be prevented if fresh infestation from neighbouring vineyards can be eliminated. Gesarol* showed great promise in laboratory tests. In another series of trials it was found that the phylloxera race from the Zürich district produced root nodules on a number of

* See also 624, 625, 855

American vine stocks, both in pots and in the open. It remains to be seen whether leaf galls develop. The American vines were immune to infection by the Tessin race.

(5) WIESMANN, R.
Vergleichende Versuche zur Bekämpfung des Traubenwicklers mit den neuen Arsenersatzstoffen. **(The control of the vine moth with the new arsenic substitutes),** pp. 117-31.
Large-scale trials conducted at Wädenswil and by Swiss growers in 1942 proved again the superiority of the new organic preparations Nirosan and Gesarol (see also *H.A.*, 14: 116 (2) and (5)) to lead arsenate and nicotine in the control of vine moths. These arsenic substitutes, which mix well with bordeaux mixture, can now be recommended to vine growers without reservation. The concentration used was 1%. The spraying for the control of the second generation of the vine moth should be timed 2-3 days after maximum flight or somewhat earlier since the spray cover retains its effectiveness. But also with the new materials spraying is useless once the majority of eggs have hatched and the larvae have reached the interior of the berries. A secondary effect of the improved control of vine moth was the reduction of *Botrytis* rot as a consequence of the reduction in perforated berries. If not combined with bordeaux mixture Gesarol was found to lose in effectiveness, because the powder did not remain suspended in the water for a sufficient time. It is hoped that the producers will be able to overcome this handicap.

550. LINDFORS, H. 632.95
Växtskyddsanstaltens nyaste utpost. **(The latest outpost of the Plant Protection Station.)**
Växtskyddsnotiser, 1944, Nr. 1, pp. 1-3.
The Plant Protection Station, Stockholm, has opened a new branch at Berga, Linköping, East-Gothland.

551. LINNMAN, N. 632.1/9
Skadedjur och växtsjukdomar i Öster-Götland, 1943. **(Pests and diseases in East Gothland, 1943.)**
Växtskyddsnotiser, 1944, Nr. 1, pp. 3-7.
The new branch of the Plant Protection Station at Berga, Linköping, introduces itself with a survey of the more common pests and diseases noted in East-Gothland during 1943.

552. GRASBY, C. G. 632.3/8: 634/635
Some common pests and diseases in the Murray irrigation areas.
J. Dep. Agric. S. Aust., 1943, **47**: 152-8.
The great majority of pests and diseases dealt with attack fruit trees or vines, but some harmful to market garden crops are also mentioned.

553. SMITH, C. O., AND COCHRAN, L. C. 634.22-2.19
A non-infectious heritable leaf-spot and shot-hole disease of the Beaty plum.
Phytopathology, 1943, **33**: 1101-3, bibl. 4.
Probably a genetical abnormality that segregates among the seedling progeny.

554. LINEBERRY, R. A., AND BURKHART, L. 634.25-2.19
Nutrient deficiencies in the strawberry leaf and fruit.
Plant Physiol., 1943, **18**: 324-33, bibl. 8.
Foliar symptoms of potassium, calcium, magnesium, phosphate and nitrogen deficiencies are described and illustrated for both Blakemore and Klondike strawberries during the fruiting stage at North Carolina Experiment Station. Analysis of the leaves showed that the severity of the deficiency symptoms varied with the supply of the nutrient. Thus leaf analysis might prove a useful index to the nutrient condition of the plant. Marked varietal differences in potassium and calcium deficiencies were observed, thus a correct diagnosis of deficiencies will require a study of the symptoms of the different varieties. Potassium concentration in each variety receiving complete nutrient solution was higher in the fruit than in the leaves in relation to the other soluble minerals. By the time phosphorus deficiency symptoms became evident there was practically no soluble phosphate in either foliage or fruit.

555. WENZL, H. 634.21-2.19
Untersuchungen über die Kräusel-(Sternflecken-) Krankheit von *Prunus armeniaca* und anderen Prunaceen). **(Curly leaf [star spot] disease of apricots and other *Prunaceae*.)**
Phytopath. Z., 1941, **13**: 588-623, from abstract *Gartenbauwiss.*, Vol. **17**, abstr. p. 22-3.
The symptoms of a disease of apricots and other *Prunaceae*—curly leaf and large yellow-green spots on the leaves—occurring in South-Eastern Germany and in Bulgaria are described. Experiments conducted over a period showed that the disorder was not caused by a virus but was of a physiological nature. The trouble was found to be associated with vigorous growth caused by severe pruning in the nursery.

556. TEAKLE, L. J. H., JOHNS, H. K., AND TURTON, A. G. 634.8-2.19: 546.56
Experiments with micro elements for the growth of crops in Western Australia. IX. Copper deficiency of currants at Gingin and its correction.
J. Dep. Agric. W. Aust., 1943, **20**: 171-84, bibl. 4.
Copper deficiency was found to be the cause of poor growth of currants and sultanas in 3 vineyards at Gingin, Western Australia. The copper content in deficient vines was 2-4 p.p.m. in December and 1-2 p.p.m. in April as against 7·5-10·0 and 2-4 p.p.m. respectively in normal plants. Control of the disorder was easily achieved by a combined treatment of copper sprays and the use of copper-containing fertilizers. An application of bluestone at the rate of 1 cwt. per acre is thought to be sufficient for several years. Presumably as a consequence of the poorly developed root system it took 3-4 years before 6-year-old vines made a substantial recovery. Newly planted vines, however, responded immediately to the treatment. The copper deficiency symptoms are described.

557. OSTERWALDER, A. 634.8-2.19
Von teilweisen " Lahmstieler " Trauben. **(Dry-stalk disease of grapes.)**
Schweiz. Z. Obst-u. Weinb., 1943, **52**: 635-8.
A physiological disorder of certain Swiss grape varieties with symptoms similar to those caused by *Botrytis* or *Coniothyrium* was studied at Wädenswil. Under the influence of great heat in summer—also in the shade—a considerable number of grapes were found to develop blackish stalks, whose outer layers were dried out. With the xylem still functioning the grapes maintained their turgor, but were poorer in carbohydrates and proteins. Where the proportion of grapes with dry stalks is sufficiently large the quality of the crop is bound to suffer from the partial early cessation of ripening.

558. ILJIN, W. S. 634.8-2.191: 581.1
Der Stoffwechsel bei der Weinrebe während der Kalkchlorose. **(The metabolism of the vine during lime chlorosis.)**
Gärtenbauwiss., 1943, **17**: 338-81, bibl. 33.
The physiological processes associated with chlorosis of vine as occurring on soils rich in lime were studied at Baden near Vienna and at Prague. The trouble was more severe in spring and in the first half of summer than after the beginning of August, when the plants started to recover on dry sunny

days. Seasonal changes in content of the following substances in healthy and diseased plants are described in detail: sugar, starch, total carbohydrates, citric acid, malic acid, tartaric acid, soluble organic nitrogen compounds, total nitrogen, proteins, iron, phosphorus, calcium, soluble magnesium, potash, Ca: K ratio.

559. ILJIN, W. S. 632.191: 581.1
Die Kalkchlorose der Pflanzen und ihre Biochemie. **(Lime chlorosis of plants and its biochemistry.)**
Jb. Bot., 1942, **90**: 464-529, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 76.

The author holds that the cause of chlorosis must be sought in the metabolism of the plants and not merely in external conditions. Experiments on a number of trees, shrubs and annual plants showed that chlorosis is produced not only by iron deficiency but by a variety of ions. The disturbed balance of the ions is responsible for the disorder rather than the surplus or lack of any one element. It was found in every case that the formation of citric acid in chlorotic plants increases in proportion as the leaves turn yellow, whilst the formation of malic acid decreases concurrently. Increased formation of citric acid can be demonstrated at a time when the leaves are still green and appear healthy. In addition, the nitrogen metabolism of the affected leaves is abnormal. As the trouble progresses, soluble nitrogen is accumulated in the form of ammonium compounds and soluble protein. Starch formation in chlorotic leaves decreases with the loss of chlorophyll, which again affects the carbohydrate metabolism. It is therefore possible to determine the degree of the disorder by means of chemical analyses. It is suggested that the chlorosis occurring on lime soils should be noted under a different term to avoid confusion with the chlorosis caused by iron deficiency.

560. ARONOFF, S., AND MACKINNEY, G. 632.191
Pyrrole derivatives and iron chlorosis in plants.
Plant Physiol., 1943, **18**: 713-5, bibl. 8.

The theory that pyrrole derivatives may replace iron in the synthesis of chlorophyll by green plants has not been confirmed. [Authors' summary.]

561. MICHAEL, G. 631.811.6
Über die Aufnahme und Verteilung des Magnesiums und dessen Rolle in der höheren grünen Pflanze. **(The uptake and distribution of magnesium and its rôle in the higher green plants.)**
Bodenk. PflErnähr., 1941, **25**: 65-120, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 1-2.

The significance of magnesium in higher plants has been studied at Berlin University. The uptake of magnesium was found to depend on the acidity of the root sphere and on the amount of other nutrients present, especially calcium. There is less danger from too much liming than from acidification. If magnesium is deficient a small application will also increase the supply of calcium. The magnesium content of young leaves was relatively constant, that of older leaves, however, varied greatly, the latter storing this element when supply is plentiful and giving it off to growing organs when there is a deficiency. The magnesium needed for chlorophyll-formation represents only a small portion of the total magnesium present in the leaves. It was found that the magnesium-ion is an essential building material of the living cell, not merely a constituent of a few substances. The supply of magnesium to the plant in fertilizers is therefore as important as that of other nutrients.

562. KIDSON, E. B., ASKEW, H. O., AND CHITTENDEN, E. 634.11-2.19: 546.46
The value of magnesium compounds for the control of magnesium deficiency of apple-trees.
N.Z. J. Sci. Tech., 1943, **25**, Sec. A, pp. 31-42, bibl. 1.

Having described the control of magnesium deficiency symptoms by injections in a previous paper (*ibid.*, 1940, 21: 305A-318A; *H.A.*, 11: 71) the authors report on further top-dressing experiments carried out at Cawthron Institute, Nelson, New Zealand, with the aim of finding the most suitable commercial method of raising the Mg standard of affected trees. About 500 or 1,000 g. magnesium oxide per tree was applied as magnesium sulphate, carbonate or dolomite. The trees improved gradually, after 3 seasons, but only one Sturmer block could be regarded as practically recovered, although its Mg level was still below normal. The effectiveness of the treatment seemed to be determined by the variety, the soil type and probably by previous fertilizer applications. The Mg content of the leader leaves was found to increase after topdressings at the same rate as the health of the trees visibly improved.

563. DIPPENAAR, B. J. 634.1/8-2.452+2.19
Diseases of fruit trees caused by leaf rust, manganese and zinc deficiencies, and their joint control.
S. Afr. J. Sci., 1941, **37**: 136-55, bibl. 6.

This is a report from the Department of Plant Pathology Stellenbosch-Elsenburg College of Agriculture in co-operation with the Western Province Fruit Research Station. The incidence, symptoms and control of three deciduous fruit diseases in the Western Cape Province are discussed. Results are summarized as follows:—

"The three diseases of stone fruit in the western Cape Province primarily responsible for a decline in tree vigour, low crop yields, and the loss of trees are leaf-rust [*Puccinia prunispinosae*], little-leaf and mottle-leaf, the latter two being caused by a deficiency of zinc and of manganese respectively. It has been experimentally shown that for the control of zinc deficiency in the peach a late spring treatment with zinc-lime (10: 5: 100) is far superior to dormant sprays (10: 100, 20: 100 or 50: 100) of zinc sulphate only. On plum trees, a dormant spray was found to be superior to a spring application. Manganese deficiency is recorded for a large number of plant species including fruit trees, ornamentals, and vegetables. Rapid and lasting control of manganese deficiency mottle-leaf was effected by spraying with manganese-containing compounds. For the control of leaf-rust in nectarine trees late in the summer, zinc-lime sprays (10: 5: 100) have proved to be as effective as bordeaux mixture (4: 4: 100). Spraying with permanganate of potash (¼%) plus hydrated lime (½%) was slightly less effective than applications of zinc-lime or bordeaux mixture."

564. SINGH, H. B. 632.111: 633/635
Effect of frost on some economic plants of Delhi.
Ind. J. agric. Sci., 1943, **13**: 279-82, bibl. 6.

The degree of resistance or susceptibility to a temperature of 28·3° F., which occurred at Delhi in January 1942, is recorded for a number of common crop plants, vegetables, fruit trees and ornamental plants.

565. ULLRICH, H. 632.111
Beziehungen zwischen Struktur und Frostresistenz bei Pflanzen. **(Relations between structure and frost resistance in plants.)**
Forschungsdienst, 1942, *Sonderh.* **16**, pp. 280-3, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 156-7.

The phenomenon of frost resistance may be due to different causes in different plants. It was therefore the author's aim to study the general laws underlying the effect of cold upon the plant. Measurements were carried out by means of electrical resistance thermometers, susceptible to radiation, throwing a light on the temperature exchange between plant and environment. Results obtained by the same methods contributed to an explanation of the phenomenon of supercooling. Further investigations made the effect of low temperatures on the physiology of the cell their object. In this connexion an interesting relation was shown to exist between the effect of cold and the double refraction of the protoplasm. It is anticipated that model experiments with gels will help to elucidate the nature of the injury suffered by the protoplasm from interior ice formation.

566. KARR, C. 634.1/2-2.111
Frost protection in orchards.
Proc. Wash. St. hort. Ass. 39th annu. Meet. 1943, 1944, pp. 94-8.

The advantages and disadvantages of coal and oil heaters are discussed and an attempt is made to evaluate the results of wind machines which accelerate the natural drainage of cold air out of orchards. They are much more easily and cheaply operated than orchard heaters. A prerequisite of success with such machines is, however, the presence of warmer air in the adjacent areas to take the place of the cold air expelled. Experience in California and Washington tends to indicate that the wind machine will, in general, only protect orchards which do not really need protection. The technique of heating is discussed. The author, who has used both oil and coal with comparatively equal satisfaction for 20 years, concludes that he would not knowingly buy a frosty orchard but he would not fail to protect by heating any acreage in his possession where there is danger of serious frost damage one year in three or oftener.

567. FUCHS, W. H. 634.1-2.111
Zur Frage der Frostschäden bei Kernobst. **(Frost damage in pome fruits.)**
Kühn-Arch., 1942, **56**: 27-40, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 114-5.

Twenty varieties were selected for the evaluation of frost damage suffered by pome fruit trees during the winter 1935/36. The data were collected from answers to 350 questionnaires and refer to all parts of Germany.

568. KONLECHNER, H., AND PÖCH, E. 634.8-2.111
Ergebnisse von Untersuchungen der Winterfrostschäden der Jahre 1938/39 und 1939/40. **(Investigations on the winter frost injuries sustained by vines in the years 1938/39 and 1939/40.)**
Wein u. Rebe, 1941, **23**: 119-61; 174-84, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 78.

The observations recorded refer to vines grown at Klosterneuburg, Vienna, and to material received from some other places.

569. LOEWEL, E. L. 632.111: 634.1/8
Beobachtungen über Frostschäden des Winters 1941/1942. **(Observations on frost damage during the winter 1941/42.)**
Dtsch. Obstbau, 1942, **A57** [sic]: 141-2, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 80-1.

Observations in Germany have shown that heavy frost injuries to roots of fruit trees tend to occur in districts where serious frost damage to rye is common. The extent of the root damage is largely determined by soil quality; on heavy soils nurseries and orchards suffered little, but they were seriously affected on light soils. The damage was particularly great in high positions exposed to the east wind. All measures of soil covering also such as sod and weeds had a protecting effect. The greatest susceptibility of the roots was shown by quinces, pears, plums and damsons. Of the apple rootstocks M XI and XVI were most resistant. Seedling rootstocks took a medium position and M II, IV and IX proved most susceptible. It is emphasized that the frost resistance of roots should be given more consideration in the selection of rootstocks.

570. KIENHOLZ, J. R. 632.8: 634.25 + 634.23
Spread of virus diseases of stone fruits in Oregon.
34th A.R. Ore. St. hort. Soc. (*57th annu. Meet. 1942*), 1943, pp. 58-61, bibl. 8.

ZELLER, S. M.
Virus diseases of stone fruits.
Ibidem, pp. 89-90.

CORDY, C. B.
Observations of buckskin disease of cherry.
Ibidem, pp. 91-2.

Observations on the spread of Western X-disease of peach in an orchard at Dallas, Oregon, indicate that the critical period for the appearance of symptoms in younger trees seems to be the time when they come into commercial bearing—hence remove infected trees on discovery. Three per cent. of the trees infected in this orchard showed symptoms in the two years 1940 and 1942, but not in 1941. This suggests the possibility that the disease might in some cases be thrown off or become dormant and ineffective. This phenomenon offers no solution to the general control problem. Cherry viruses, especially that known as rusty mottle, appear to be spreading fairly rapidly. It is highly probable that one source of infection is insect vectors, but, until the specific insects responsible are definitely known, control measures against them would appear futile. Elimination of diseased stock and the use of clean propagating materials appear to be the best remedy at present.

Zeller discusses the differences between the Eastern-X and the Western-X disease, the one striking difference being apparently that the Eastern type spreads only from chokecherry to peach but the Western from peach to peach. There would appear to be a close connexion between some types of buckskin virus of cherry and peach viruses; this is discussed. Rusty mottle, mottle leaf, lace leaf and vein clearing diseases of cherry and their symptoms are briefly described. Zeller agrees with Kienholz on the subject of control.

Cordy describes the so-called buckskin disease of cherry. It was first observed in 1937, since when, despite the removal of some trees and the cutting back of others, a small yearly increase has been noted. A positive diagnosis is given by the following symptoms:—the fruit develops normally until one-third grown but then slows down in growth, being at harvest time perfectly white and smaller than normal. In some cases the fruit drops prematurely. Difference in varietal susceptibility and symptoms has been noted. No control measure is known.

571. KÖHLER, E. 632.8
Beiträge zur Kenntnis der Viruswanderung in der Pflanze. **(Notes on virus migration in the plant.)**
Biol. Zbl., 1942, **62**: 203-20, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 132.

Experiments and observations are recorded, which support the view that virus migration in plants takes place exclusively in the reserve material-stream of the phloem. The discontinuity in the spreading of the potato X-virus in tobacco leaves discourages the hypothesis of transport by diffusion. The fact that after secondary infection of tobacco leaves with X-virus larger or smaller portions near the leaf tip remain free from virus is thought to prove that the virus spreads in the young leaf with the stream of reserve material. When a certain stage of leaf development is reached and the stream of reserve materials is reversed, the virus will not spread any farther in the leaf.

572. KEITT, G. W., AND MOORE, J. D. 634.23-2.8
Masking of leaf symptoms of sour-cherry yellows by temperature effects.
Phytopathology, 1943, **33**: 1213-5.

Preliminary investigations indicate that 16° C. is a favourable temperature for expression of the leaf symptoms of cherry yellows. These symptoms were masked at 20° C. or higher temperatures.

573. MAIER, W. 634.8: 632.8
Untersuchungen zur Frage der Übertragbarkeit der Reisigkrankheit durch den Boden. **(Investigations on the transmission of vine dwarfing** [Reisigkrankheit] **through the soil.)**
Wein u. Rebe, 1943, **25**: 29-41, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 162.

Careful investigations on the dwarfing of vines (Reisigkrankheit) showed that the soil is not the only source of infection.

574. BLODGETT, E. C. 634.22-2.3/4+2.19
Prune diseases.
Proc. Wash. St. hort. Ass. 39th annu. Meet. 1943, 1944, pp. 59-63.
Diseases found important in Idaho, and in particular the symptoms of leaf curl, and leaf spot and their possible causes are briefly discussed.

575. MILLER, P. W. 634.51-2.3
Current investigations on walnut blight and recommendations for its control in war time.
Proc. Western Nut Growers Ass. 28th annu. Meet. 1942, 1943, pp. 142-6.
Investigations indicate that bordeaux spray at 4-2-100 or yellow cuprous oxide spray at the rate of 1 lb. in 100 gallons of water+an alkyd resin spreader-sticker should be used, the operation taking place preferably in the early pre-bloom, late pre-bloom and early post-bloom stages of development. Dusting requires the expenditure of more copper. Details of technique are given.

576. BRAUN, A. C. 632.314
Studies on tumor inception in the crown-gall disease.
Amer. J. Bot., 1943, **30**: 674-7, bibl. 6.
Crown gall bacteria, *Phytomonas tumefaciens*, inoculated into periwinkle (*Vinca rosea*) initiated galls within 36 to 48 hours. These galls when submitted to heat treatment sufficient to kill the bacteria but not the plant at the end of this period remained small. If, however, the bacteria were allowed to incubate in the plant for 4 days before being killed the tumours continued to develop into large overgrowths independently of the presence of the bacterial inciting agent.

577. HALPERIN, L. 634.63: 632.3
La tuberculosis del olivo. (***Phytomonas savastanoi* a bacterial disease of olives.**)
Bol. Fom. rur. B. Aires **7**, 1942, pp. 4.
The bacterial disease of olives, *Phytomonas savastanoi*, manifests itself by the production of characteristic tumours on twigs and branches (illustrated in colour). It is locally dangerous and in some districts in Argentina it has a depressing effect on yield. Precautions in the nursery consist in sealing pruning wounds, not propagating from infected plants, in avoiding excessive pruning and in burning any affected plants. Similar common sense precautions are suggested for the plantation. Trees which are attacked may be treated by cutting off the branches 15 cm. below the tumour, disinfecting the wound with 5% carbolic acid and covering it with mastic. Trunk tumours are excised and the wounds covered with a mixture of virgin wax 500 g., vaseline 500 g., tallow 50 g. applied when hot, 60° C. A bordeaux spray should be given as a precaution after prolonged rains, hail and at leaf fall.

578. KIENHOLZ, J. R. 634.13-2.3/4+2.19
Observations on certain pits and other blemishes of pear fruits.
Proc. Wash. St. hort. Ass. 39th annu. Meet. 1943, 1944, pp. 51-7, bibl. 18.
Blemishes are described under the following headings:—I. Diseases resulting in fruit deformity or internal symptoms. (1) Black end. Occurs most severely in semi-arid regions and is generally associated with the use of *P. serotina* and *P. ussuriensis* rootstocks. (2) Cork spot (other names sometimes used—cork spot, cork, drought spot, bitter pit). Symptoms suggest some form of unbalanced water relation. (3) Boron deficiency known by form and structure of pits found. (4) Cottony cork. Noticeable for a broad deep pitting towards the stem ends. Cause unknown. (5) Lithiasis. Distinguished by small warts of crumbly stone cells on surface. Most frequent in arid regions. Probably due to faulty water conditions. (6) Stony pit. A virus disease common in Bosc pears (sometimes referred to as bitter pit, drought spot, internal necrosis, cork, internal cork, crinkle, measles, oak bark). Symptoms—which are described in detail—include few to many rather circular or irregular pits about $\frac{1}{8}$ in. deep. (7) Stigmonose. Pits or deformities due to insect punctures. (8) Pink end. Is associated with attacks of the *Macrosiphum macrosiphum* aphid. (9) Frost injury. II. Diseases resulting mostly in surface blemishes only. (1) Spray russets due to spray injury. (2) Frost russet. (3) Mildew russet. Due to *Podosphaera leucotricha*. (4) Sunburn. Symptoms on Bosc pears, which differ from those on others, are described.

579. MOORE, M. H. 634.11-2.42
Control of apple scab.
Fruitgrower, 1944, **97**: 295-6.
Practical suggestions on how to avoid failure in scab control. No more than two weeks should elapse between consecutive sprayings at green-cluster, pink-bud and petal fall. Accurate timing may render the midsummer sprayings unnecessary. If pink-bud follows green-cluster within a week the pink-bud spray should still be given to the most scab-susceptible varieties and consist of lime-sulphur alone, at 1 or $1\frac{1}{2}$%. Petal fall spray must start at the stated time even if there is still a good sprinkling of blossom on the trees. With colloidal sulphur used instead of lime-sulphur the risk of injury, small in any case, will be further reduced. Lead arsenate should only be applied with the green-cluster spray. It is emphasized that if scab gets among the fruitlets they will drop. Petal fall spray should contain nicotine against sawfly, but if sawflies attack after the scab spray the nicotine may be given a week later with a spreader but not with soap. The scab spray cannot wait. It is more profitable to subordinate all other work to spraying in April and May rather than to postpone it for even a few days. Copper lime dust has been successfully used to tide over a long blossom period and does less damage than wet copper sprays. Copper and sulphur dusts do not seem to affect bees.

580. TAYLOR, G. G., AND BRIEN, R. M. 634.11-2.4
Ripe-spot of apples (*Neofabraea malicorticis*).
N.Z. J. Sci. Tech., 1943, **25**, Sec. A, pp. 63-72, bibl. 5.
The increasing incidence of ripe spot of apples, *Neofabraea malicorticis*, first reported from New Zealand 8 years ago, is attributed to altered handling of the apple crop brought about by the unfavourable storage conditions in which fruit has to be held because of restriction of the overseas market. Injury takes the form of shallow dark-brown to black depressed lesions rarely exceeding 30-40 mm. in diameter with a thin layer of sub-epidermal, dry, spongy tissue. The symptoms are easily confounded with those of other types of apple spotting. As a guide the symptoms of the chief of these are also described. Factors affecting development of the disease are advanced maturity at picking, too high storage temperature (the lowest possible without freezing is recommended) and delay in placing fruit in store. Sturmer, a late-season apple largely used for storage, is the most susceptible.

581. HADORN, C. 634.8-2.4
Eine Rotbrenner Epidemie in den Reben der Bündner Herrschaft. (**An anthracnose epidemic of the vine in the Bündner Herrschaft, Switzerland.**)
Schweiz. Z. Obst-u. Weinb., 1943, **52**: 616-26, bibl. 1.
A survey conducted by the author in summer 1943 proved that the severe outbreak in some Swiss districts of anthracnose of vines, caused by *Pseudopeziza tracheiphila*, was not in any way connected with the compulsory application of a copper-Sandoz spray, as popular belief would have it. The weather conditions favouring mass development of the fungus, the possibilities of forecasting an outbreak of anthracnose and the symptoms of the disease are discussed.

Apart from cultural control measures which aim at developing the root system, early spraying and a second treatment 10 days later are recommended.

582. Fresa, R. 634.25-2.4
" Frosty mildew " del duraznero en el delta del Paraná (Argentina). **(Frosty mildew of peach in the Paraná delta.)**
Rev. argent. Agron., 1943, **10**: 231-4, bibl. 4.
A technical description of *Cercosporella persica*, the causal fungus of frosty mildew of peaches and now reported for the first time from Argentina.

583. Willison, R. S. 634.25-2.48
Brown rot and other fungal wastage in harvested peaches.
Sci. Agric., 1944, **24**: 221-33, bibl. 3.
The paper deals with data on the comparative incidence of brown and other rots in harvested peaches as affected by various spray schedules, by refrigeration for different periods and by other factors over the period 1938-42 at St. Catharine's Experiment Station, Ontario. The most effective spray schedule comprised applications at blossom time, at shuck fall, 2 to 3 weeks before harvest and just before picking. Contamination in the pack was reduced by wrapping the fruit in tissue. Prompt refrigeration at 45° F., or at 33° F. if the transportation period exceeded 1 week, gave a good control. The rate of incidence of brown rot after removal from cold store to room temperature increases with the length of the cold storage period. *Rhizopus nigricans*, black mould, does not develop during cold storage but may become serious after storage. It cannot be controlled by spraying. The inclusion in the pack of sodium meta-bisulphite tablets wrapped in a piece of paper towel slightly reduced incidence of brown rot but was less effective than spraying besides causing injury to a percentage of the fruit.

584. Wormald, H. 634.54-2.4
Nut drop: a disease of cultivated hazel nuts.
Gdnrs' Chron., 1944, **115**: 60-1.
A disease of cultivated cobnuts hitherto unrecorded for Britain, though known on the Continent, is described and illustrated. The causal organism is probably *Monilia fructigena*, the common brown rot fungus of fruit trees, though other fungi capable of rotting apples and plums under laboratory conditions were also found. The disease is under investigation at East Malling Research Station and particulars of cases of cobnuts falling while still unripe are asked for.

585. Pontis Videla, R. E. 634.51-2.411
El " mal de la tinta " del nogal en la Republica Argentina. **(Crown rot of walnut in Argentina.)**
Rev. B.A.P., 1943, **27**: 313: 31-3, bibl. 1.
An account of crown rot (*Phytophthora citrophthora*) of walnuts which is becoming prevalent in Argentina. The symptoms are similar to those of citrus gummosis. The trunk is gradually girdled, the bark lesions may extend far up the tree and downward into the roots for some distance, the leaves turn yellow and the tree may die in a year or two. The Spanish name " ink disease " is probably derived from the exudate which becomes black on exposure. In some of its macroscopic symptoms the disease resembles melaxuma (*Dothiorella gregaria*) of walnuts. Taken early, control is fairly simple. The affected parts should be excised, cutting well into the healthy bark and the wounds disinfected with any reliable fungicide, such as bordeaux mixture, formalin, etc. The disease is associated with prolonged excess of moisture in the soil. In Argentina it is prevalent in districts where there is no control of irrigation. [Fuller details will be found in *Rev. argent. Agron.* 8: 4: 317-25, and an account of early work on the disease by Smith and Barratt, Crown rot of *Juglans* in California, appears in *J. agric. Res.*, 1931, 43: 885-904.]

586. Wilson, G. F., and Green, D. E. 634.711-2.4+2.77
Observations on two raspberry troubles.
J. roy. hort. Soc., 1944, **69**: 79-86, bibl. 7+6.
A deterioration of raspberry stocks at Wisley was found to be associated with the presence of two organisms which are now under observation: the raspberry cane midge (*Thomasiniana theobaldi*) and the raspberry cane blight (*Leptosphaeria coniothyrium*), the entomological part being treated by G. F. Wilson, the mycological part by D. E. Green. At the present stage of the investigation the authors found it necessary to confine their communication to a description of the organisms, of the damage they cause and of the control measures so far attempted. Although full control of the cane midge has not yet been achieved the following measures could be recommended for a considerable reduction of the pest: (1) Cut out and burn all badly infested canes, (2) spray the young and less infested canes with nicotine-soap wash, (3) dress the soil at the base of attacked canes with naphthalene twice or thrice a year, (4) leave attacked canes over the winter until May in order to allow parasites to emerge. No suggestions can be made as yet for control of the blight. It has not even been shown whether the fungus can attack canes uninjured by midges. Hence it remains possible that complete control of the midge will at the same time solve the blight problem.

587. Smith, L. G., and Luce, W. A. 632.6/7: 634.2
Insects of soft fruits.
Proc. Wash. St. hort. Ass. 39th annu. Meet. 1943, 1944, pp. 43-7, bibl. 8.
Directions are given for the control of the chief pests of peaches and apricots, cherries, and plums and prunes in Washington.

588. Pickett, A. D., Neary, M. E., and MacLeod, D. 632.653: 634.75
The mirid, *Calocoris norvegicus* Gmelin, a strawberry pest in Nova Scotia.
Sci. Agric., 1944, **24**: 299-303, bibl. 2.
The mirid, *Calocoris norvegicus*, is shown to be the most frequent cause of malformed fruit of the strawberry in Nova Scotia. The burning of the straw mulch round the strawberries in early spring exercises a good control. Nymphs were found to be much more numerous on the unburned than on the burned area. No imported infestation could be attributed to the mulch. Sprays and dusts were comparatively useless. The burning of the mulch is not considered good horticultural practice, and other means of control are sought.

589. Smith, R. E. 632.654.2
Relative value of sulphur and of oil in control of mites.
Proc. Wash. St. hort. Ass. 39th annu. Meet. 1943, 1944, pp. 103-6.
A review of the life history of *Tetranychus pacificus* is followed by notes on treatment with colloidal sulphur and other sulphur-containing sprays and dusts. The use of oil for this mite is confined to the summer, two sprays generally being necessary. The common recommendation is from 1 to 1½ gallons of actual oil of light or light-medium weight with a U.R. of 90. Correct timing is essential but difficult. The author prefers the use of sulphur.

590. Anon. 632.654.2
La arañuela roja. **(Red spider.)**
Sugest. oportun. Fruticult. Rio Negro, Dec. 1943, pp. 5.
In the Valle district (Argentina) heavy attacks of red spider were completely dispersed by the use of 3% Tank Mix oil spray in winter and 2% lime-sulphur wash in spring. The treatment is admittedly expensive but in view of its success should not be required annually.

591. BLANCHARD, E. E. 632.654.2
Tres ácaros dañinos para los cultivos Argentinos. **(Three mites harmful to crops in Argentina.)**
Rev. Fac. Agron. La Plata [for] 1939, 1940, **24**: 11-8.
Three new species are described and illustrated, viz. *Tenuipalpus pseudocuneatus*, *Anychus verganii*, *Anychus schultzi*, the first two appearing on citrus, the third on castor oil.

592. JENKINS, C. F. H. 634.11-2.75
The apple leafhopper.
J. Dep. Agric. W. Aust., 1943, **20**: 190-5, bibl. 4.
Leafhopper (*Typhlocyba froggatti*) injury was recorded for the first time in Western Australia in 1942 occurring in the Bridgetown district. Life history, symptoms and control are described.

593. JOUBERT, C. J. 634.8-2.752
Mealy bugs on vines.
Bull. S. Afr. Dep. Agric. **243** (*Fruit Ser.* **30**), 1943, pp. 20, bibl. 23.
The two pests considered are *Pseudococcus maritimus* and *P. citri*. Their life histories, the damage caused by them to vines, their insect predators and their relation to ants are discussed. Finally the control of ants and, in the last resort, fumigation methods are described in detail.

594. CHERIAN, M. C. 632.752: 634.11
The San José scale (*Quadraspidiotus perniciosus* Comst.) in the Nilgiris.
Plant Chron., 1944, **39**: 12-3.
The San José scale has quite recently made its appearance on apples in the Nilgiris, Southern India. The importance of scrutinizing and fumigating imports of fruits and nursery stocks is stressed.

595. BERAN, F. 632.752
Die Bekämpfung der San José-Schildlaus (*Aspidiotus perniciosus* Comst.) mit Spritzmitteln. **(Control of the San José scale by spraying.)**
Z. PflKrankh., 1942, **52**: 289-316, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 133.
The relative value of the usual winter sprays and of 4 home-made oil preparations, which were emulsified by addition of soap or other alkalis, was tested for the control of San José scale. The latter were 100% efficient at a concentration of 4%. Also fruit tree carbolinium from heavy and medium oils proved satisfactory in contrast to lime-sulphur and fruit tree carbolinium emulsified. Dinitro-*o*-cresol achieved control only at a concentration of 2% and had therefore to be discarded. Tests with isolated females (technique described in detail) showed that death often occurs as late as 6 weeks after treatment. The question whether autumn treatment of fruit trees with oil emulsions increases susceptibility to frost, can probably be answered in the negative, a further help in the control of the San José scale. The tests were carried out at the Vienna branch of the Biologische Reichsanstalt für Land- u. Forstwirtschaft.

596. BERAN, F. 632.752: 632.944
Begasung von Baumschulerzeugnissen mit Blausäure. **(The gassing of nursery products with HCN.)**
Flugbl. biol. Reichsanst. Land- u. Forstw., Berlin, **180**, 1941, pp. 1-5, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 29.
Directions for the control of the San José scale by gassing with HCN.

597. ZWEIGELT, F. 632.753
Beiträge zur Kenntnis der Blattlausgallen. **(Aphis galls.)**
Biol. gen., 1943, **16**: 554-72, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 163-4.
His study of aphis galls has led the author to the conclusion that the response of the leaf tissue to aphis attack is for the benefit of the host and does nothing to help the pest. The actual course of events is described.

598. BÖRNER, C. 634.23-2.753
Die Frage der züchterischen Bekämpfung der schwarzen Blattläuse der Kirschen. **(The control of black cherry aphis by breeding for resistance.)**
Z. PflKrankh., 1943, **53**: 129-41, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 127.
Experiments showed that one type of the black cherry aphis, *Myzus cerasi*, is confined to acid cherries and the other, *M. cerasi pruniavium*, to sweet cherries. Entomological details are given. The hope is expressed that it may be possible to raise seedlings resistant to both aphis strains from crosses of sweet and acid cherries.

599. ROSENSTIEL, R. G. 634.23-2.77
The effect of certain chemicals on the cherry fruit fly.
J. econ. Ent., 1943, **36**: 800-1, bibl. 2.
The most effective chemicals tested against *Rhagoletis cingulata* were rotenone, calcium antimony tartrate and basic copper arsenate in spray form. The best contact dusts were DN and rotenone. The use of a sweet bait decreased the time taken to kill.

600. SNAPP, O. I. 634.25-2.78
Propylene dichloride for peach tree borer control.
J. econ. Ent., 1943, **36**: 765-8.
Trials indicated that good control of the peach borer (*Sanninoidea exitiosa*) without tree injury can be expected from propylene dichloride emulsion used at strength $\frac{1}{4}$ to $\frac{1}{3}$ lower than that wanted for ethylene dichloride emulsion. Further tests are necessary to determine optimum strengths.

601. BAKER, H. 632.78
Orchard tests of chemically treated bands for codling moth control in the Missouri River Valley.
J. econ. Ent., 1943, **36**: 760-4, bibl. 7.
A discussion of the successful use of chemically treated bands based on the use of 1 lb. of β-naphthol to 1·5 pints of mineral oil, plus, when used, 0·5 oz. aluminium stearate, applied to single faced corrugated paper 2 in. wide with 30 to 40 corrugations per foot.

602. ISELY, D. 632.78: 634.11
Early maturing varieties in codling moth control.
J. econ. Ent., 1943, **36**: 757-9, bibl. 1.
Experience in Arkansas indicates that the problem of codling can be better and more economically controlled if blocks of apples which are harvested at the same time are grouped together in the field.

603. SKRIPNIKOVA. 632.78: 634.11
Tobacco smoke as a means of controlling the apple moth.
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljjamas, 1940, No. 7-8, pp. 32-4.
Heaps consisting of old dry dung, straw, old dry strawberry leaves and other rubbish, were put under apple trees. On each heap about 400 g. of waste tobacco leaves were spread. The heaps were set alight and made to produce as much smoke as possible. Moths were killed in large numbers estimated by sampling. Another count was done in autumn, as a result of which it was shown that smoking had reduced the insect population. The smoking method is recommended for use in orchards which, by reason of topographical or other obstacles, are difficult to spray.

604. NEWCOMER, E. J., AND OTHERS. 632.78
Controlling the codling moth with nonarsenicals.
Proc. Wash. St. hort. Ass. 39th annu. Meet. 1943, 1944, pp. 107-10.
The spray materials discussed here include cryolite, nicotine bentonite, phenothiazine, xanthone, the last-named—all things considered—showing most promise. In addition a method of spraying tree trunks and lower limbs with dinitro-ortho-cresol is being satisfactorily evolved. This is highly toxic to the hibernating larvae. It must be used during the dormant season.

605. THOMPSON, B. G. 634.54-2.78
The filbert worm [*Metissopus latiferreanus*]. Recommendations for 1943.
Proc. Western Nut Growers Ass. 28th annu. Meet. 1942, 1943, pp. 146-50.
Spraying with lead arsenate 3 lb. to 100 gallons water + appropriate spreader is recommended.

606. SAXBY, S. H. 632.51
Weeds.
N.Z. J. Agric., 1943, **67**: 15-9, 85-9, 183-6, 247-51, 331-6, 407-10; 1944, **68**: 9-12.
A description of a large number of annual, biennial and perennial weeds in New Zealand and their control.

607. HARVEY, W. A. 634.1/2-2.954
Weed control in orchards.
Proc. Wash. St. hort. Ass. 39th annu. Meet. 1943, 1944, pp. 77-81.
The main ill effect of weeds in Washington orchards is the removal of water. When labour is scarce and dear the presence of such weeds as Canada thistle and poison ivy may make it scarcer and dearer. Chemicals used with varying success include sodium chlorate, carbon bisulphide, arsenates, oil sprays, sulphuric acid, cyanamides and ammonium sulphamate. Other methods include variations of clean cultivation systems and cover cropping to smother. Finally a method evolved in recent years is light burning or searing. The weeds are given a light searing with a low temperature slow flame burner using a cheap oil. The weeds should wilt down in a few days. This is much more effective than burning off with a hot flame and the weeds are very much more damaged by the treatment. Experiments in Idaho showed a kill of white top and Canada thistle in 2 years with 3 to 5 searings a year.

608. DURHAM, H. E. 632.954
Sodium chlorate.
Gdnrs' Chron., 1944, **115**: 17.
Recurrence of suckers from fruit trees was prevented by placing small pads of wadding saturated with a 5% solution of sodium chlorate on the wounds made by their removal and leaving there for a few days. After removal of the wadding the wounds were allowed to dry before covering with grafting wax. Other applications of sodium chlorate mentioned refer to the control of *Convolvulus arvensis*, unwanted shrubby growth and dandelions.

609. FRAZIER, J. C. 632.51
Food reserve depletion and synthesis in field bindweed, *Convolvulus arvensis* L., as related to 7-day and 14-day intervals of cultivation.
Plant Physiol., 1943, **18**: 315-23, bibl. 11.
Regenerated bindweed plants which developed following cultivation to a depth of 4 inches were studied at the Kansas Experiment Station. From the data presented it appears that cultivation every 14 days would destroy one-fifth more of the readily available carbohydrates and more than double the loss of protein nitrogen in the rhizomes and shoots as compared with 2 cultivations at intervals of 7 days in the same unit of time. [From author's summary.]

610. WILSON, F. 632.51: 632.96
The entomological control of St. John's wort (*Hypericum perforatum* L.) with particular reference to the insect enemies of the weed in southern France.
Bull. Coun. sci. industr. Res. Aust. **169**, 1943, pp. 87, bibl. 58.
In southern France St. John's wort is largely controlled by its insect enemies, chiefly *Agrilus hyperici* and *Chrysolina gemellata*. These two have now been successfully established in Australia and together with *Chrysolina hyperici*, a species imported from England and now after some years becoming increasingly common in Australia, they seem likely to give a useful degree of control.

611. FRICKE, E. F. 632.51
White weed (*Lepidium draba*).
Tasm. J. Agric., 1943, **14**: 121-5, bibl. 7.
Lepidium draba, a member of the cress group, is a troublesome perennial field weed in Tasmania [and parts of U.S.A.] and various countries of temperate climates. It goes under a variety of popular names such as white weed in Tasmania, hoary cress in N.Z. and U.S.A., hoary pepperwort in England. It is here described and illustrated. Control may be obtained by regular shallow cultivation at 2 week intervals or where this is not practicable by spraying at fortnightly or perhaps longer intervals to kill top growth and thus prevent the plant from replenishing its food reserves. The following sprays have been used with success: sodium chlorate 10%, arsenic pentoxide 6% and tar oil.

612. ODERKIRK, G. C. 632.692
About those rabbits.
Wis. Hort., 1944, **34**: 86-8.
Instructions and diagrams are given for making a Wellhouse box trap for rabbits. Properly sited and concealed the trap is said to be very successful.

613. KENT WAR AGRICULTURAL EXECUTIVE COMMITTEE. 634.1/7-2.95
Fruit tree spraying in Kent.
Agriculture, 1944, **51**: 43-4.
The Kent War Agricultural Executive Committee has developed a contract system for spraying orchards, under which, during 1943, nearly 7,000 acres of fruit trees were treated with tar oil, petroleum and D.N.O.C. winter washes and well over 8,000 acres were sprayed in spring or early summer. The average charge was based on less than 2 hours per acre in winter and on about 1¼ hours per acre in spring.

614. GROVES, A. B., MILLER, H. J., AND TAYLOR, C. F. 634.23-2.941
Tri-State cherry-spray investigations.
Bull. Pa agric. Exp. Stat. **447**, 1943, pp. 26, bibl. 14, being *Bull. Va agric. Stat.* **354** and *Bull. W. Va agric. Stat.* **310**.
A co-operative study of fungicides for the control of leaf spot of sour cherries in the Cumberland-Shenandoah region was made at the agricultural experiment stations of Pennsylvania, Virginia and West Virginia. A split schedule of early-season applications of lime-sulphur and later applications of bordeaux mixture is recommended as the best solution at this time, which will combine satisfactory disease control with least leaf or fruit injury. The organic materials tested showed promise of future development, causing no injury, but they proved, with one exception which ranked with bordeaux, unsatisfactory as fungicides. Bordeaux dwarfed fruit size but increased its sugar content. Fruit development seemed to be somewhat retarded by organic sprays.

615. FREAR, D. E. H. 632.951 +632.952
A catalogue of insecticides and fungicides.
Science, 1943, **98**: 585.
A catalogue of all materials which have been tested for insecticidal and fungicidal properties is in course of preparation at the Pennsylvania State College Department of Agricultural and Biological Chemistry, U.S.A. The author asks workers in these fields to supply him with any unpublished data, reprints or literature citations dealing with insecticidal or fungicidal tests with specific materials even though the results may have been negative. The information should include the name and formula of the chemical compound, the name of the test organisms and a general statement of toxicity. Each bona fide contributor will receive a copy of the publication, which because of the size of the undertaking may not be available for wide distribution.

616. DIMOND, A. E., HEUBERGER, J. W., AND HORSFALL, J. G. 632.952
A water soluble protectant fungicide with tenacity.
Phytopathology, 1943, **33**: 1095-7, bibl. 3.

A new water soluble protectant fungicide has been discovered in disodium ethylene bisdithiocarbamate. It forms an invisible film type of coverage, becoming water insoluble when dried on the foliage and, hence, resistant to removal by rain. These properties form important practical differences between the new compound and other derivatives of dithiocarbamate acid used as fungicides, such as those sold under the trade names of Thiosan, Arasan and Fermate, but because the surface activity of the material drain-off during spraying occurs sooner the deposit does not build up so well as that of these proprietary compounds. Probably for this reason control of *Alternaria solani* on tomato and *Phytophthora infestans* on potato was not so good as expected. Promising control was obtained of *Diplocarpon rosae* and *Sphaerotheca pannosa* on roses, *Venturia inaequalis* on apple, *Cercospora apii* on celery and *Pythium ultimum* on pea seeds. Such plant injury as occurs is negligible. It is suggested that it should prove useful on near-ripe fruit and on ornamentals where residues are objectionable, on onions where the foliage is difficult to wet and to growers who have sprayers without agitators. The paper is from the Department of Plant Pathology, Connecticut Experiment Station.

617. STODDARD, E. M., AND HEUBERGER, J. W. 632.952
Eradicant action of fungicides on spores on living plants.
Phytopathology, 1943, **33**: 1190-5.

The eradicant action of copper, sulphur and organic fungicides on spores and sporulating hyphae of apple scab and carnation rust was evaluated by a method evolved by the authors.

618. YARWOOD, C. E. 631.944: 632.952.1
Bordeaux injury at low temperatures.
Plant Physiol., 1943, **18**: 508-16, bibl. 5.

In tests with greenhouse plants the increased transpiration and decreased leaf temperatures which resulted from bordeaux spray are associated with bordeaux injury to foliage at low temperatures.

619. YARWOOD, C. E. 632.952.21
The function of lime and host leaves in the action of bordeaux mixture.
Phytopathology, 1943, **33**: 1146-56, bibl. 12.

In experiments conducted at the University of California the effectiveness of copper fungicides tested on glass slides differed widely from that shown in a test on leaves. To achieve 95% inhibition of germination of bean rust urediospores on glass required 0·6 mg. Cu as bluestone or 64 mg. Cu as bordeaux. To ensure 95% control on leaves 2·6 mg. Cu were needed as bluestone and 0·18 mg. as bordeaux. The ratio Cu in bluestone: Cu in bordeaux on glass=about 1: 100 is therefore reversed on leaves to about 15: 1. Moreover, 350 times as much spray was required with bordeaux when the tests were on slides as when on leaves. These findings are considered to have an important bearing on the evaluation of fungicides by means of *in vitro* tests. The function of lime in the action of bordeaux was shown by placing leaves sprayed with (1) 0·1% bluestone and (2) bordeaux mixture in a moist chamber for 4 hours. In case (1) 57% of the copper applied was absorbed by the leaves with corresponding reduction in control, whilst the lime in the bordeaux mixture held the copper in a form toxic to the rust and relatively unavailable to the host. The protective value of bluestone against bean rust and bean powdery mildew was found to increase with the addition of increasing amounts of lime until approximately a 1: 1 ratio was reached, the eradicative effectiveness of the mixture against established infections, however, decreased progressively with additions of lime. Tests with cucumber downy mildew are also reported.

620. HOWARD, N. F., WEIGEL, C. A., SMITH, C. M., AND STEINER, L. F. 632.951: 634.1/8+635.1/7
Insecticides and equipment for controlling insects on fruits and vegetables.
Misc. Publ. U.S. Dep. Agric. **526**, 1943, pp. 52, 10 cents.

The bulletin deals with the nature of the chemicals more commonly used to control insects on fruits, vegetables and flowering plants and gives information on how they should be prepared for use. Spraying and dusting equipment is also discussed.

621. QUAYLE, H. J. 632.951
The increase in resistance in insects to insecticides.
J. econ. Ent., 1943, **36**: 493-500, bibl. 36.

Seven species of insects of 4 different orders and of widely different food habits are reviewed from the standpoint of their increase in resistance to insecticides representing contact and stomach poison sprays, fumigants and a bait spray. Examples of a few other insects and mites are mentioned where circumstantial evidence tends to support the same proposition.

622. WIGGLESWORTH, V. B. 632.951
Action of inert dusts on insects.
Nature, 1944, **153**: 493-4, bibl. 6.

The experiments discussed have a bearing on the passage of insecticides through the cuticle of the insect.

623. POTTER, C., AND TATTERSFIELD, F. 632.951
Ovicidal properties of certain insecticides of plant origin. (Nicotine, pyrethrins, derris products.)
Bull. ent. Res., 1943, **34**: 225-44, bibl. 15.

Pyrethrins, nicotine, rotenone and a derris resin were tested at Rothamsted under standard laboratory conditions for their ovicidal effect. The test subjects were *Pieris brassicae*, *Plutella maculipennis*, *Aphis rhamni*, *Ephestia kühniella* and *Sitotroga cerealella*. The plant-derived insecticides compared favourably with the recognized ovicidal synthetics lauryl thiocyanate, β-butoxyβ'thiocyanodiethyl ether and 3: 5 dinitro-*o*-cresol and can be recognized as potential ovicides.

624. WIESMANN, R. 638.1: 632.951
Weitere Versuche über Gesarol und Honigbienen. **(Further trials on the effect of Gesarol upon honey bees.)**
Schweiz. Z. Obst-u. Weinb., 1942, **51**: 245-51.

More elaborate experiments with Gesarol confirmed previous results (*ibid.*, 1942, 51: 155-65; *H.A.*, 14: 116 (2) and (5)) at Wädenswil that this spray cover is not harmful to bees. However, spraying should not be carried out during blossom time, since direct contact with the liquid kills the bees.

625. WIESMANN, R. 632.951: 634.1/8
Neue Versuche mit Arsenersatzstoffen im Obstbau. **(New tests of arsenic substitutes* in fruit growing.)**
Schweiz. Z. Obst-u. Weinb., 1942, **51**: 155-65.

Three organic substitutes for arsenic spray mixtures were tested on fruit trees at Wädenswil:—(1) Nirosan, a product of I. G. Farben, Germany, which had proved very effective in viticulture. This stomach poison is of limited usefulness in fruit growing. (2) Nirosit or preparation Nr 23·52, of a similar chemical constitution but with a markedly wider range of effect, being a stomach as well as a contact poison. It mixes well with fungicides and is effective against some insects which are resistant to arsenic. (3) Gesarol, a Swiss product of great promise with practically as wide a range as arsenic. It is not poisonous to humans and warm-blooded animals and acts both as a stomach and contact poison. The preparation mixes well with fungicides, does not cause leaf burn at the normal concentration of 1%

* See also 549, 624, 855.

and the spray cover is very resistant to rain. The tests showed that Gesarol is a full substitute for arsenic for the control of pests, only its effectiveness against fruit worms requires further study. None of the 3 products is poisonous to bees.

626. Ginsburg, J. M. 634.25-2.951.23
Basic lead arsenate: its effect on peach trees and compatibility with various chemicals.
J. econ. Ent., 1943, **36**: 531-5, bibl. 24.
Peach trees at New Jersey Experiment Station showed no arsenical injury after 7 successive sprays with basic lead arsenate, whereas only 2 sprays of acid lead arsenate caused foliage and twig injuries. Basic lead arsenate did not release water-soluble arsenic when mixed with various spray ingredients and remained virtually stable in solutions ranging in pH from 2·0 to 11·2, whereas acid lead arsenate was stable only in a pH range of 3·3 to 8·5. [From author's summary.]

627. Beran, F. 631.537: 632.944
Eine neue Gaskammertype für Baumschulen. **(A new gas chamber for use in nurseries.)**
NachrBl. dtsch. PflSchDienst, 1942, **22**: 78-81, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 135-6.
The author has designed a gas chamber of 30 cubic metres for HCN fumigation of all nursery products. The corrugated iron of ordinary sheds is replaced by sheet steel.

628. Smith, A. J., and Whitnall, A. B. M. 634.8-2.944
The concentration and distribution of HCN in relation to vine fumigation.
Sci. Bull. S. Afr. Dep. Agric. **158**, 1941, pp. 14, bibl. 10, being *Ent. Ser.* No. **9**, 3d.
The control of mealy bugs on vines by fumigation with liquid HCN, applied by means of the Hydro-cy pump, was studied at Rustenburg. The fumigations were carried out in daytime during the winter under heavy gas-tight canvas covers, 100 ft. long. A dosage of 18 c.c. liquid HCN per 100 cu. ft. and an exposure of 60 minutes or more proved satisfactory. The HCN should be applied at not more than 3 points along the cover. The importance of making the tent really gas-tight is emphasized.

629. Arhangeljskaja, T. I. 632.96
The biological control of crop pests. [Russian.]
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljjamas, 1940, No. 7-8, pp. 3-8.
The Institute is attempting to breed a hardy and active race of *Trichogramma*, a parasite on many pests of agricultural crops and fruit. It is also testing various methods of propagating the parasite.

630. Ripper, W. E. 632.96
Biological control as a supplement to chemical control of insect pests.
Nature, 1944, **153**: 448-52, bibl. 20.
It is shown that chemical control of insect pests is greatly limited by the development of resistant races through artificial selection caused by the insecticide. It is proposed to overcome this limitation by a combination of chemical and biological control through the use of selective insecticides. The comparative physiology of the economically important insect groups requires systematic exploration if progress is to be maintained.

631. Ripley, L. B., Hepburn, G. A., and Dick, J. 632.78: 634.3
Mass breeding of false codling moth (*Argyroploce leucotreta* Meyr.) in artificial media.
Sci. Bull. S. Afr. Dep. Agric. **207** (*Plant Industry Ser.* **53**), 1939, pp. 18, bibl. 6, 3d.
Mass breeding in oranges of the false codling moth having been found impracticable, successful attempts have been made to raise the moth artificially. Methods are here described.

632. Haller, H. L., and McIndoo, N. E. 633.88.32.491-2.951
The castor-bean plant as a source of insecticides.
J. econ. Ent., 1943, **36**: 638, bibl. 9.
In spite of much publicity to the contrary there is no evidence that the castor bean plant itself has any value as an insect pest repellant or destroyer. Evidence on the insecticidal value of any of its constituents is scanty and contradictory and so far no specific substance toxic to insects has been isolated or identified.

633. Ball, R. S. 632.951
Pyrethrum cultivation in Kenya.
Nyasaland agric. quart. J., 1944, **4**: 1: 7-18.
A revised and amended version of the article issued by the Kenya Farmers' Association, 1935.

634. Belov, M. G. 632.951
The use of machinery in the cultivation and harvesting of *Anabasis aphylla* growing in a wild state. [Russian.]
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljjamas, 1940, No. 9-10, pp. 18-24.
Anabasis aphylla (family of *Chenopodiaceae*) is a perennial plant growing to a height of 30 to 75 cm. Its root system is strong and penetrates down into the ground for several metres, thus enabling the plant to withstand long periods of drought. It may be propagated both by seeds and vegetatively. Most of the anabasine to be found in this plant is contained in the young green parts and is accumulated until flowering begins, after which it almost entirely disappears. In southern Kazahstan the maximum quantity of it occurs in early June when it may amount to about 2·5%. It is an isomer of nicotine for which it may serve as a substitute. The plant also contains lupinine, aphyllin, aphylin and up to 15% of oxalic acid. At the base of the plant, where the old stems meet, it is very woody and may be between 20 and 25 mm. in diameter. This hinders the use of machinery for cutting the crop and only the tops of the shoots can be cut. If, however, the woody stems are cut off at, or even below, soil-level, a plentiful outgrowth of young shoots takes place, which may be repeatedly harvested by machinery over a period of years. It is best to cut the woody stems during autumn, winter, or in early spring before growth has begun.

635. Stellwaag, F. 632.6/7: 634.8
Stand und Krisis der Schädlingsbekämpfung im Weinbau. **(The present position of pest control in viticulture and its difficulties.)**
Z. PflKrankh., 1943, **53**: 113-24, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 164-5.

Köhler, E. 632.8
Über den Nachweis von Virus im Narbensekret viruskranker Pflanzen. **(The occurrence of virus in the stigma secretion of plants affected by virus.)**
Ber. dtsch. bot. Ges., 1942, **60**: 384-7, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 161.

Elliott, C. 632.3
Recent developments in the classification of bacterial plant pathogens.
Bot. Rev., 1943, **9**: 655-66, bibl. 29.

Stapp, C. 632.314
Der Pflanzenkrebs und sein Erreger *Pseudomonas tumefaciens*. 10. Mitt. Die Virulenzsteigerung von *Pseudomonas tumefaciens* durch Titan. **(Crown gall and its causal organism *P. tumefaciens*. 10th commun. Increasing the virulence of *P. tumefaciens* with titanium.)**
Zbl. Bakt., 1942, II, **104**: 395-401, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 99-100.

DEMAREE, J. B., AND WILCOX, M. S. 634.711-2.4
The fungus causing the so-called "*Septoria*" leaf-spot disease of raspberry.
Phytopathology, 1943, **33**: 986-1003, bibl. 23.

KEITT, G. W., AND OTHERS. 632.48: 634.22
Occurrence of the imperfect stage of *Sclerotinia laxa* on *Prunus cerasus* in Wisconsin.
Phytopatholcgy, 1943, **33**: 1212-3.

ZELLER, S. M., OWENS, C. E., AND EVANS, A. W. 632.4: 634.23 + 634.25
Experiments on the control of brown rot of cherries and peaches, 1942, including notes on brown rot control in apricots. (Progress report.)
34th A.R. Ore. St. hort. Soc. (*57th annu. Meet. 1942*), 1943, pp. 53-7.
A single season's work only.

DAVIS, L. G. 634.13-2.752
Pear psylla control in 1943.
Proc. Wash. St. hort. Ass. 39th annu. Meet. 1943, 1944, pp. 161-8.
Also includes work in B.C.

ZWEIGELT, F. 632.753
Die Gallenbildung im Lichte der Spezialisation und Immunität. **(Gall formation in the light of specialization and immunity.)**
Biol. gen., 1943, **16**: 573-92, from abstract *Gartenbauwiss.*, Vol. **17**, abstr. p. 164.

JANCKE, O., AND WILHELM, A. F. 632.76: 634.8
Versuche zur Bekämpfung des Rebstichlers (*Bytiscus betulae* L.) mit arsenfreien Insekticiden. **(The control of *Bytiscus betulae* (*Rhynchites betuleti*) with non-arsenical insecticides.)**
Wein. u. Rebe, 1942, **24**: 127-40, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 101.

WEISE, M. 634.23-2.77
Die Saugöffnungen und die Pseudotracheen der Kirschfruchtfliege *Rhagoletis cerasi* L. **(The sucking apparatus and the pseudotracheae of the cherry fruit fly.)**
Gartenbauwiss., 1943, **17**: 211-26, bibl. 13.

SNAPP, O. I., AND THOMSON, J. R. 634.25-2.78
Life history and habits of the peachtree borer (*Sanninoidea exitiosa*) in the South-eastern States.
Tech. Bull. U.S. Dep. Agric. **854**, 1943, pp. 24.

OSSOWSKI, L. L. 634.9: 632.951
The chemical destruction of forest pests.
Endeavour, 1944, **3**: 32-7, bibl. 15.

WELLMAN, R. H., AND MCCALLAN, S. E. A. 632.952
An analysis of factors causing variation in spore germination tests of fungicides. IV. Time and temperature.
Contr. Boyce Thompson Inst., 1942, **12**: 431-49, bibl. 18.

MCCALLAN, S. E. A., AND WELLMAN, R. H. 632.952
Fungicidal *versus* fungistatic.
Contr. Boyce Thompson Inst., 1942, **12**: 451-63, bibl. 11.

MCCALLAN, S. E. A., AND WELLMAN, R. H. 632.952
A greenhouse method of evaluating fungicides by means of tomato foliage diseases.
Contr. Boyce Thompson Inst., 1943, **13**: 93-134, bibl. 20.

MCCALLAN, S. E. A., AND WELLMAN, R. H. 632.952
Cumulative error terms for comparing fungicides by established laboratory and greenhouse methods.
Contr. Boyce Thompson Inst., 1943, **13**: 135-41, bibl. 10.

WELLMAN, R. H., AND MCCALLAN, S. E. A. 632.952
Correlations within and between laboratory slide-germination, greenhouse tomato foliage disease and wheat smut method of testing fungicides.
Contr. Boyce Thompson Inst., 1943, **13**: 143-69, bibl. 13.

WELLMAN, R. H., AND MCCALLAN, S. E. A. 632.952
A system for classifying effectiveness of fungicides in exploratory tests.
Contr. Boyce Thompson Inst., 1943, **13**: 171-6, bibl. 8.

WAIN, R. L., AND WILKINSON, E. H. 632.952.21
Studies upon the copper fungicides. VI. The solution of copper from bordeaux and burgundy mixtures.
Ann. appl. Biol., 1943, **30**: 379-91, bibl. 25.

PARKER-RHODES, A. F. 632.952
Studies in the mechanism of fungicidal action. VI. Water.
Ann. appl. Biol., 1943, **30**: 372-9, bibl. 6.

HOOKER, W. J., WALKER, J. C., AND SMITH, F. G. 632.952
Toxicity of beta-phenethyl isothiocyanate to certain fungi.
Amer. J. Bot., 1943, **30**: 632-7, bibl. 12.

CHISHOLM, R. D., AND KOBLITSKY, L. 632.944
Sorption of methyl bromide by soil in a fumigation chamber.
J. econ. Ent., 1943, **36**: 549-51, bibl. 1.

GOODEN, E. L. 632.951
Density and particle size of derris and cubé powders.
J. econ. Ent., 1943, **36**: 632-3, bibl. 6.

SIEVERS, A. F., LOWMAN, M. S., AND RUSSELL, G. A. 632.951
Factors affecting the rotenone content of devils' shoestring (*Tephrosia virginiana*).
J. econ. Ent., 1943, **36**: 593-7, bibl. 2.

BATT, R. F., MARTIN, H., AND WAIN, R. L. 632.951.8
The use of toxic polynitro derivatives in pest control. II. The estimation of dinitro-*o*-cresol in winter washes.
Ann. appl. Biol., 1944, **31**: 64-8, bibl. 5.

FINNEY, D. J. 632.951: 519
The application of the probit method to toxicity test data adjusted for mortality in the controls.
Ann. appl. Biol., 1944, **31**: 68-74, bibl. 6.

ULLYETT, G. C., AND SCHONKEN, D. B. 632.962
A fungus disease of *Plutella maculipennis* Curt. in South Africa, with notes on the use of entomogenous fungi in insect control.
Sci. Bull. S. Afr. Dep. Agric. **218**, 1940, pp. 24, bibl. 26, being *Ent. Ser.* No. **5**.

FRAZIER, J. C. 632.54
Nature and rate of development of root system of *Lepidium draba*.
Bot. Gaz., 1943, **105**: 244-50, bibl. 6.
A troublesome weed in U.S.A. [and in S. Africa, see *H.A.*, 14: 611].

VEGETABLES AND OTHER CROPS.

636. LAMM, R. 635.1/7
Nyare undersökningar på köksväxtodlingens område. **(Recent vegetable research.)**
Sverig. pomol. Fören. Årsskr., 1943, **44**: 88-98, bibl. 9.

This review of recent research on vegetables is almost entirely concerned with work done in Scandinavia, excluding breeding work and plant protection. A Danish paper (*Aarbog for Gartneri*, 1943, 24: 216-52), which deals with vegetable varieties, gives an account of tests with spring lettuce varieties for forcing in the greenhouse and in hot and cold beds, and with late cabbage and cauliflower varieties. This is followed by the review of a report of the Horticultural Station at Alnarp describing vegetable varieties approved in 1942 (*Meddel. Statens Trädgårdsförsök* 16, 1943). Another Alnarp bulletin by B. Hylmo (*Meddel. Statens Trädgårdsförsök* 21, 1943) surveys variety tests of 1934-42. Of the first class and first class "élite" varieties 19 are of foreign origin and 26 the product of Swedish plant breeding. Extensive experiments on paprika (*Capsicum annuum*) were carried out at Berlin-Dahlem by P. Popoff (*Gartenbauwiss.*, 1943, 17: 446-92) who tested 85 varieties received from Bulgaria [for further details see Abstract 696]. In the field of chemical investigations a Swedish and a Norwegian paper are reviewed. B. Hylmö (*Meddel. Statens Trädgårdsförsök*, 17, 1943) studied the formation of disaccharides in cabbage at various localities from 1926 to 1941. The disaccharide content was obtained as the difference between total sugar and monosaccharide content. The total sugar content was fairly constant at different latitudes, the values for Alnarp being 3 and 4% of the fresh weight for early and late cabbage respectively, but the so-called disaccharide quotient—i.e. disaccharides expressed as percentage of total sugar—varied greatly. A relation between this quotient and the temperature at harvest time could be shown to exist, since the proportion of disaccharides rose with decreasing temperature. Late varieties at Alnarp had a quotient of 18 as against 5 in early varieties. The quotient rose by 2-3 units with a decrease of each degree in monthly average temperature with late varieties and by 0·8 units with early varieties. The capacity of late varieties to convert monosaccharides into disaccharides is explained as a function of their cold resistance. It is concluded that with cabbage the disaccharide quotient can be regarded as an indicator of hardiness and storage capacity. Finally the paper of the Norwegian A. H. Bremer (*Meld. Statens forsøksgård i grønsakdyrking Kvithamar, Stjørdal*, 21, 1940, II, 1941) on the vitamin C content of vegetables is reviewed in detail. The results of his analyses, which were carried out at Skøyen and compared with figures obtained by Johanssen at Alnarp.

637. MAURER, E., AND OTHERS. 634/635(072)
Gartenbauforschung im Dienste der Kriegsernährung. **(Horticultural research and wartime nutrition.)**
Leistungssteigerung im Gartenbau, H. 1, R. Bechtold & Co., Wiesbaden, 1943, pp. 295, RM. 19.50, from review *Gartenbauwiss.*, 1943, Vol. 17, abstr. p. 140-1.

The book contains a preface by E. Maurer and contributions by a number of authors dealing with the following subjects: *Roemer* and *Fuchs*, summary of breeding research work in vegetable growing. *Nicolaisen*, methods and aims in the selection of certain vegetables. *Frimmel*, the significance of the prolonged flowering character in breeding work. *Kopety*, the effect of planting distance on quality and yield of onions. *Zycha*, Mushroom culture. *Scheunert* and *Wagner*, the vitamin B_1 content of certain vegetables. *Scupin*, the influence of preservation on the vitamin C content of peas and beans. *Schuphan* and *Reinhold*, the vitamin content of carrots. *Reinhold* and *Lucas*, the pickling of sugar beet leaves. *Boshart*, research on medicinal plants. *Kemmer*, the significance of individual rootstock clones in a study of localities. The effect of frost during the winter of 1941/42 upon the roots of fruit trees. *Hilkenbäumer*, the behaviour of young rootstocks in Central Germany. *De Haas*, the manuring of older trees. *Vogel*, gooseberry fertilizer trials. *Heiss*, the penetration of sugar during the process of quick-freezing fruit. *Mehlitz*, standardization of pectin products based on their freezing capacity. *Zeller*, pectins as molecule colloids. *Baebge*, soil testing in horticulture on a field scale. *Herbst*, population biology in respect of horticultural smallholders.

638. RUBIN, B. A. 635.1/7: 581.192
Some biochemical investigations on vegetable varieties. [Russian.]
Vestnik Ovoščevodstvo i Kartofelj, 1941, No. 1, pp. 49-61.

Experiments were carried out at the Institute of Biochemistry, Moscow, with radishes, carrots, cabbages, onions, and other edible plants, to discover to what extent differences between varieties of each of the plants could be accounted for by corresponding differences between the actions of certain enzymes in the tissues. Among the differences to be observed between the varieties those were studied which manifested themselves in the following phenomena:—the time required to reach maturity; the storage of carbohydrates, including the proportions of their constituent sugars; and the annual or biennial habit. The enzymes which influenced, and in some cases largely accounted for, the manner in which each of these were displayed in any particular instance were catalase, invertase, saccharose, peroxidase, amylase, and proteinase. The conclusion was reached that enzyme activity was most pronounced in varieties which mature early, and that because the synthetic power of saccharose predominated over the hydrolytic whenever oxidation predominated over reduction in the tissue of plants which mature late, more carbohydrates and a larger proportion of saccharose are produced and stored than when the opposite conditions prevail, as in early-maturing plants. Plants, therefore, which have a long period of maturity, or are biennial rather than annual, and in which both the total quantity of sugar and the proportion of it which consists of saccharose are larger than in quickly-growing plants, owe these characteristics to a certain behaviour of their enzymes.

639. HAWTHORN, L. R. 635.1/7
Tests of vegetable varieties for the Winter Garden region, 1937-41.
Bull. Tex. agric. Exp. Stat. **626**, 1943, pp. 50, bibl. 23.

Bulletins 508 (see also *H.A.*, 6: 329) and 546 of the Texas station gave accounts of adaptability trials in the Winter Garden region of Texas of some 50 different vegetables including 750 varietal names. The present bulletin concerns 200 varieties of 17 vegetables introduced into the same trials since 1936. Not only the adaptability but also the varietal characteristics have been noted in detail. The varieties of eggplants and peppers were studied in co-operation with the Bureau of Plant Industry, U.S. Department of Agriculture.

640. DÍAZ-PACHECO, S., AND NOGUERA, J. R. 635.1/7: 658.8
Distribucion de legumbres y hortalizes en las ciudades de Rio Piedras y San Juan. **(The methods of marketing vegetables in the cities of Rio Piedras and San Juan.)** [English summary 3 pp.]
Bol. Estac. exp. agric. Rio Piedras **62**, 1942, pp. 40, bibl. 2.

A note of the approximate percentages absorbed by the various middlemen is followed by suggestions for improvement in market practice. The costs of motor haulage of vegetables to market are discussed.

641. ANON. 635.1/7
Contract vegetable production in N.S.W.
Agric. Gaz. N.S.W., 1944, **55**: 3-6, 30.
A survey of the position.

REICHELT, K. 635.1/7
Der landwirtschaftliche Gemüsebau. **(Vegetable growing on a farm scale.)**
Leistungssteigerung im Gartenbau, H.6. R. Bechtold & Co., Wiesbaden, 3rd edition, 1942, pp. 80, RM. 2.50, from review *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 83-4.

BRESCHKE, —., AND OTHERS. 635.1/7
Fruchtfolgen im Gemüsebau. **(The use of rotations in vegetable growing.)**
Forschungsdienst, 1942, *Sonderh.* **16**, pp. 61-9, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 150-1.
Data from 14 vegetable growing districts of Germany.

PANSE, E. 631.561.2
Entwicklung einer Einzelpflanzen-Dreschmaschine für Zuchtmaterial landwirtschaftlicher und gärtnerischer Nutzpflanzen. **(A single-plant threshing machine handling agricultural and horticultural breeding material.)**
Züchter, 1942, **14**: 117-9, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 102.

642. HAMILTON, R. G. 635.1/7: 631.564
Grading tables and packing bins for vegetables.
N.Z. J. Agric., 1943, **67**: 403-5.
The grading tables and packing bins now used in New Zealand for the crating and grading of vegetables for overseas supply are described with the help of diagrams.

643. MAIWALD, K., AND HOFFMANN, O. 635.1/7
Umwandlung von Wiesen- in Gartenland durch Umbruch und Düngung. **(Transforming grassland into market garden land by ploughing up and manuring.)**
Gartenbauwiss., 1942, **17**: 39-50, bibl. 5.
A plan based on scientific principles for the ploughing up and manuring of 7 hectares of grassland near Stuttgart, which is to be used for market gardening.

644. HALL, J. W. 631.511
Double-digging versus single digging.
Gdnrs' Chron., 1944, **115**: 38-9.
In a series of experiments carried out at the College of Agriculture, Edinburgh, double digging failed to produce higher yields than single digging with onions and beet and did not warrant the extra cost.

645. DONEEN, L. D., AND MACGILLIVRAY, J. H. 635.1/7: 631.531
Germination (emergence) of vegetable seed as affected by different soil moisture conditions.
Plant Physiol., 1943, **18**: 524-9, bibl. 9.
Most vegetable seeds gave good germination over the entire range of available water and seem to fall into 4 groups, based on their ability to germinate near the permanent wilting percentage. Seeds of all crops germinated in a shorter time at high soil moistures than at low. Many crops germinated less at the highest soil moisture (18% in sandy loam) than at some lower moisture level, but the differences were only significant for spinach and New Zealand spinach. No germination could be obtained for celery below 11% soil moisture, which was well above the permanent wilting percentage. 100% germination of celery was obtained in a Petri dish by adding a drop of water to each celery seed after planting or by covering the soil surface with wet filter paper or a wet cloth.

646. WOODMAN, R. M. 635.1/7: 631.8: 631.589
The nutrition of vegetables in sand.
Ann. appl. Biol., 1944, **31**: 22-30, bibl. 12.
The yield data from the author's series of investigations on vegetable nutrition in sand have been plotted against the concentrations of N, P and K employed. While too much available nitrogen or phosphorus may depress yields of tops and/or roots of certain vegetables, turnips being especially susceptible to excess phosphorus, no case of excess available potassium was observed. The turnip is recommended as a type plant for indicating the state of soil fertility as regards available (nitric) nitrogen. Five pages of the paper are taken up by the 21 graphs illustrating the results discussed.

647. BOSHART, K. 635.1/7: 631.83
Versuche über Kalidüngung im Gemüsebau. **(Potassium fertilizer trials in vegetable growing.)**
Prakt. Bl. Pflanzenb., 1942, **20**: 25-42, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 107.
The optimum amounts of potash, expressed as kg. K_2O per hectare, were determined for the following vegetable crops: dwarf beans 120-160, celeriac 160, carrots and beetroot 120, red cabbage 100-120, onion 80. The effect of chlorine and sulphate compounds apparently depends on the weather and is therefore not always uniform. There is no difference in the response of onions and beetroot as between the chloride and the sulphate salt, but dwarf beans seem to utilize the sulphate better than the chloride. Celeriac, carrots and red cabbage prefer the chloride.

648. BOSHART, K. 635.1/7: 631.811.9
Über die Bedeutung von Spurenelementen im Gemüsebau. **(The significance of trace elements in vegetable growing.)**
Prakt. Bl. Pflanzenb., 1942, **19**: 205-11, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 75.
A short summary, based mainly on the results of certain German workers on the application of Mn, Cu, Cr and B to vegetables grown on moor soils.

649. WETZEL, A. 635.1/7: 631.8
Düngungsfragen im Rieselfeld-Gemüsebau. **(The manuring of vegetables on sewage farms.)**
Ernähr. Pfl., 1942, **38**: 65-9, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 75.
The average potassium- and phosphorus-content of sewage farm soils around Berlin is 15·6 and 14·6 mg.% respectively. In spite of the accumulation of nutrients the application of a complete mineral fertilizer to such heavy feeding vegetables as cabbage is advocated, the following amounts per hectare being recommended: 100-120 kg. N, 240-300 kg. K_2O and 4,500 kg. CaO.

650. MARGOLINA, K. P. 635.1/7: 631.874
The use of green manuring for vegetables. [Russian.]
Vestnik Ovoščevodstvo i Kartofelj, 1941, No. 1, pp. 93-102.
Beans, peas, vetches, lupins, oats, mustard and a few other crops were grown for green manure, and their effects on radishes, turnips and cucumbers were observed. With the exception of mustard, their application compared favourably with that of artificials. They were suitable not only as catch-crops in immediate succession to a main crop, but were found also to increase the yield of radishes, which were sown only 10 days after the green crops, at an early stage of growth, had been incorporated in the soil. In one experiment it was shown that when gramineous plants were grown together with leguminous they were able to obtain some nitrogen from the latter. In addition to the effect of green manures on the crop following them, the process of decay which they underwent in the soil before they could exert a manurial effect was also studied. It was found that

the decay of plants as green manure was more complete in light than in heavy soils, and among young plants than old. The total quantity of nitrogen which the soil acquired was largest after the largest quantity of green manure had been given to it; but the quantity of nitrogen yielded to the soil for every gram of decayed manure present was largest after the smallest quantity of green manure had been applied. A mixture of oats and vetches decayed more readily than two varieties of lupin. Another factor influencing the decay of green manure was the depth of burying. Decay in light soil was most effective when the crop was buried deeply, and in heavy soil when it was buried more superficially.

651. SECRETT, F. A. 631.875: 635.1/7
The use of composts in market-gardening.
Ann. appl. Biol., 1943, **30**: 395-7.

In a paper read before the Association of Applied Biologists, London, 11 June, 1943, Mr. Secrett discussed his experiences in the use of compost. For market garden crops especially an adequate supply is essential and in the absence of stable manure other materials must be substituted. At the moment straw is plentiful and if properly treated and combined with waste material it is of great value. Composting straw alone is objectionable because of the difficulty of wetting it, though here an atomizer used on a hose pipe is useful. To the straw per ton should be added $\frac{3}{4}$ cwt. sulphate of ammonia and 4 cwt. hydrated lime. The compost should be turned once and will in summer be ready in 12 weeks. Crude straw should not be ploughed in nor should the humus be completely broken down to dust. The speaker, however, reduced labour costs and improved fertility of poor land by applying a dressing of 8 tons dry straw/acre. This was sprayed by means of an irrigation plant with a solution of sulphate of ammonia, or alternatively 3 cwt. sulphate of ammonia/acre was applied on top of the straw. The fields were then disc harrowed to break up and mix in the straw, dressed with 10 cwt./acre hydrated lime and disc harrowed again. The material had fairly rotted down in 5 weeks. The best time for this work is early autumn when the soil is still warm.

652. CROWTHER, E. M. 631.875: 635.1/7
Composts, their preparation and value.
Ann. appl. Biol., 1943, **30**: 392-5.

A paper read before the Association of Applied Biologists, London, 11 June, 1943. The subject is discussed from the point of view of the farmer and the market gardener. The value of various bulky ingredients (straw, sludge, bracken) and the best methods of treating them are considered.

653. MERKLE, F. G., AND DUNKLE, E. C. 631.8: 632.19
Burning injury from fertilizers on greenhouse and field crops.
Suppl. **1** to *Bull.* **446**, *the 56th A.R. Pa agric. Exp. Stat.*, 1943, pp. 3-4.

A great expansion has taken place in the greenhouse industry in the eastern United States. Soil tests have shown that a frequent cause of failure to crop is excess of nutrient salts in the soil. An attempt has been made experimentally to find a ceiling value for salt concentrations. It was found that the speed of germination of all plants studied—apparently tomato, soybean, maize, potatoes, cucumber, cabbage and radish—was greater in soil to which no fertilizers had been added. Growth on the other hand tolerated higher salt concentrations, reaching its peak at about ·3 to ·4% of total soluble salts. Exact figures are given for the tests made.

654. (MACPHERSON, N. J.) 635.52: 631.544
Glasshouse soil heating.
Fruitgrower, 1944, **97**: 106.

Data are provided of soil heating experiments for winter lettuce carried out at the Institute of Agriculture, Hutton, near Preston, Lancashire. With a soil temperature maintained at 60° F. in December and raised to 65° F. as daylight hours increased, lettuce sown the first week in December was cut for market on 24 February and the returns were increased by not less than 25% as compared with a corresponding house sown a fortnight later but not soil heated. The adjustment of soil temperature in accordance with length of day is necessary, otherwise a soft type of growth may be produced.

655. SEEMANN, J. 631.544: 581.036
Über die Temperaturverhältnisse in einem bewetterten Tiefkühlgewächshaus. **(The temperature conditions in a controlled low-temperature-greenhouse.)**
Gartenbauwiss., 1942, **17**: 186-92, bibl. 4.

The breeder for frost resistance needs a greenhouse wherein to expose large numbers of plants to controlled low temperatures. Such a plant has been put up at Müncheberg, Germany, and its working is described. The greatest difficulty was to obtain horizontal temperature levels of complete uniformity, but this has been achieved.

656. RICHARDSON, H. H., AND OTHERS. 632.951.1: 631.544: 632.944
Studies on nicotine fumigation in greenhouses.
Circ. U.S. Dep. Agric. **684**, 1943, pp. 15.

Chemical and insecticidal tests were made with 5 methods of vaporizing nicotine for fumigating a greenhouse and on various factors affecting the efficacy of the methods. The varying susceptibility of insects to the nicotine treatments is noted. Repeated fumigations produced no apparent injury on lettuce, tomato and various other plants.

657. GODFREY, G. H., AND YOUNG, P. A. 632.944: 631.462
Soil fumigation for plant disease control.
Bull. Tex. agric. Exp. Stat. **628**, 1943, pp. 40, bibl. 74.

The root-knot nematode, root-lesion nematode, tomato wilt fungus, southern blight fungus, damping-off fungi, and weeds usually were controlled in soils fumigated with chloropicrin at rates of 2·5 to 4 millelitres per cubic foot (400 to 600 lb. per acre). The root-knot nematode generally was controlled in soil fumigated with carbon disulphide at rates of 1,000 to 3,000 lb. per acre; with methyl bromide at 165 to 300 lb. per acre; and with pentachlorethane at 200 lb. per acre. Less satisfactory results were secured with xylene, ethylene dichloride, sodium cyanide and formaldehyde. Paper impregnated with hoof-and-horn glue, casein glue, or vegetable paste, and adequately sealed at the edges, was most satisfactory for confining chloropicrin and carbon disulphide in the soil. However, good results were secured with these chemicals when the fumigated soil was covered with Sisalkraft, asphalt-coated paper, or when the surface of the soil was kept wet. Low concentrations of the fumigants were effective when the fumigants were tightly confined in the soil. Soil fumigation boxes, made gas-tight by glueing the boards together and sealing the cover, were very effective for confining fumigants to kill plant-disease fungi and other pests in potting soils. Detailed directions for the fumigation method of soil sterilization are given, together with an outline of the necessary precautions. [From authors' summary.]

658. WILSON, G. F., AND GREEN, D. E. 635.1/7: 632.3/8
A simple calendar of control measures against vegetable pests and diseases in gardens and allotments.
J. roy. hort. Soc., 1944, **69**: 104-11.

Part I deals with such soil pests as slugs, wireworms, cutworms, leatherjackets. Part II, which is arranged in the form of a calendar, describes symptoms and control measures of 42 vegetable pests and diseases.

659. ANON. 635.1/7: 632.6/7
Insect pests of vegetable crops.
J. Dep. Agric. S. Aust., 1943, **47**: 188-97.
The description of the more important insect pests in South Australia and their control is supported by many illustrations and a clearly arranged table.

660. LE ROUX, J. C., AND STOFBERG, F. J. 632.651.3
Control of the root-knot nematode by cultural practices.
Sci. Bull. S. Afr. Dep. Agric. **188** (*Plant Industry Ser.* **44**), 1939, pp. 29, bibl. 9.
Heavy losses are incurred in S. Africa in tobacco, tomatoes, potatoes, peas, beans, cucurbits, flowers and other crops as the result of attack by *Heterodera marioni*. The life history of the pest is described. Infestations can be effectively checked by regular ploughing and hoeing, which eliminates the host plants, or by planting resistant crops. Once commercial control of the pest is obtained it is safe to grow only one susceptible annual crop to maturity. Clean cultivation for 9 to 12 months gives better control than 6 months' summer or winter treatment and results in higher yields.

661. TAYLOR, A. L. 632.651.3: 632.944
Soil fumigation with chloropicrin for control of the root knot nematode, *Heterodera marioni*.
Phytopathology, 1943, **33**: 1166-75, bibl. 18.
Satisfactory control of the root knot eelworm was obtained by applying 200 lb. chloropicrin per acre to sandy loam soil containing no undecayed roots. In the presence of fresh infected tomato roots 300 lb. were required. The liquid was poured into holes in the soil 6 in. deep, 14-16 in. apart. Immediately after treatment the soil was either covered or the top inch was moistened with water. The handling of chloropicrin causes great irritation to the skin and eyes.

662. NORRIS, K. R. 632.654.2: 632.951
Experiments with insecticides against the red-legged earth mite (*Halotydeus destructor* Tucker).
Bull. Coun. sci. industr. Res. Aust. **171**, 1943, pp. 28, bibl. 15.
This mite, which is recorded in South Africa and southern Australia, is a major pest of many vegetables, causing stunted plants and often death of seedlings. A method of control by poison bait is here described, the most satisfactory poison being sodium arsenate. The sprays found best were a preparation containing lauryl thiocyanate, a rotenone-white oil emulsion and sprays incorporating nicotine sulphate. Nicotine dusts also proved effective.

663. MASON, A. C., CHISHOLM, R. D., AND BURGESS, E. D. 632.76
Ethylene dichloride treatments for the immature stages of the Japanese beetle.
J. econ. Ent., 1943, **36**: 734-7, bibl. 2.
Satisfactory tests have led the U.S. Department of Agriculture to authorize the dipping of balled or potted plant balls up to 10 in. in diameter in an emulsion prepared from an emulsible mixture of ethylene dichloride for 10 seconds as a quarantine measure for plants infested with the Japanese beetle. Most of the pupae and at least one-third of the eggs as well as all the larvae are killed by such treatment. Application to the surface of the soil also gives good results.

664. GLEN, R., KING, K. M., AND ARNASON, A. P. 632.765
The identification of wireworms of economic importance in Canada.
Canad. J. Res., 1943, **21**, Sec. D, pp. 358-87, bibl. 59.
Over 30 different wireworm types are separated in the key presented. Their ecology and economics are discussed briefly and reference is given to the most important literature on biology, morphology, and control. Although descriptive morphological details are omitted, the separating characters given are derived from extensive detailed studies. [Authors' abstract.]

665. STONE, M. W., AND HOWLAND, A. F. 632.765
Life history of the wireworm *Melanotus longulus* (Lec.) in Southern California.
Tech. Bull. U.S. Dep. Agric. **858**, 1944, pp. 30, bibl. 10, 10 cents.
A serious pest of vegetable and grain crops in southern California.

MUGGERIDGE, J. 632.78
The white butterfly (*Pieris rapae* L.). II. Parasites of the butterfly. III. Introduction of parasites, method and technique.
N.Z. J. Sci. Tech., 1943, **25**, Sec. A, pp. 1-18, bibl. 9; and 19-30, bibl. 2 [for 1 see H.A., 14: 182].

666. WISECUP, C. B., AND HAYSLIP, N. C. 632.729
Control of mole crickets by use of poisoned baits.
Leafl. U.S. Dep. Agric. **237**, 1943, pp. 6.
Mole crickets, *Scapteriscus* spp. and *Gryllotalpa hexadactyla*, are liable to damage vegetables, tobacco, peanuts, strawberries and grasses in North and South Carolina, Georgia, Florida, Alabama and Mississippi. They can be kept in check by poison bait, such as wheat bran (dry) 100 lb., sodium fluosilicate 8 lb., water (to moisten) 3 to 5 gal. The necessary technique is discussed.

667. GOLOBORODJKO, E. F., AND ŠEVČENKO, Z. I. 632.78: 635.1/7
Euxoa conspicua. [Russian.]
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Vilijamas, 1940, No. 1-2, pp. 21-3.
This article contains a description of *Euxoa conspicua*, the omnivorous larvae of which gnaw through young plant stems, the petioles of leaves, and the growing points of plants. Cabbages, cucumbers and tomatoes are among the plants attacked. One control method is the treatment of the ground which contains the pupae at a depth of 7-8 cm. with poison.

668. ANON. 633.491-1.532.2
Canadian seed potato eye trade.
Nature, 1944, **153**: 160.
In Canada the raising of potato crops from eyes rather than from tubers is the custom in remote areas to which transport is difficult. The trade is strictly controlled by the Canadian Department of Agriculture. The eyes must be cut only from certified seed and weigh not less than 35 to the lb. They must be free from obvious disease or pest injury and must be packed in specified types of carton, a copy of the Department's planting directions being enclosed with each batch. The directions advise immediate planting in moist but not dry soil. Eyes to be stored are kept for a week at 75° F. to encourage suberization; subsequent storage is at a lower temperature. If the eyes are to be despatched soon after cutting they are dusted with limestone or waxed to prevent drying. Recent experiments at Kew (see *H.A.* 14: 188) suggest that precautions against drying out may be unnecessary and that a system of controlled drying might well reduce weight without affecting viability.

669. ALLEN, L. A. 633.491-2.3: 633.52
Spore forming bacteria causing soft rot of potato and retting of flax.
Nature, 1944, **153**: 224-5, bibl. 3.
The experiments show that *Bacterium subtilis* produces enzymes which cause soft rot of potato and will ret flax.

670. SMITH, K. M. 632.8
Studies on the spread of certain plant viruses in the field.
Ann. appl. Biol., 1943, **30**: 345-8, bibl. 2.
When tobacco was used as a test plant in the field, potato virus X did not spread from infected to clean plants whether

paced or in contact, but the aphis-transmitted potato virus spread rapidly in similar conditions while cucumber mosaic virus spread much more slowly. The experiments were conducted at the Plant Virus Research Station, Cambridge.

671. KULASH, W. M. 632.765: 633.491
The ecology and control of wireworms in the Connecticut River Valley.
J. econ. Ent., 1943, **36**: 689-93, bibl. 8.
Dichloroethyl ether gave a high kill of wireworm in loose-packed potato hills but imparted a disagreeable taste to the potatoes. Under packed soil conditions of truck crops it made poor penetration.

672. HORSFALL, J. G., AND TURNER, N. 633.491-2.952.1
Injuriousness of bordeaux mixture.
Amer. Potato J., 1943, **20**: 308-20, bibl. 20.
The paper is a condensation of a bulletin of the Connecticut Agricultural Experiment Station now in preparation for publication. The application of bordeaux mixture was found to reduce potato yields by 9-13% before treatment begins to increase the yield above the check. In other words, the treatment is beneficial only if the damage to the crop produced by blight or pests is greater than 9-13%. Previous work had shown that the lime component in the mixture is chiefly responsible for the dwarfing of the plant, but that magnesium is able to antidote the deleterious effect both of lime and of copper. Hence the recommendation to use dolomitic lime reduced to half the weight of the bluestone. Further suggestions are: spray as late in the season as possible (the damage decreases as the plants develop), use more liquid at a lower concentration to compensate for smaller amount of bordeaux mixture per acre with better coverage (for instance 300 gal. per acre of 2-1-50 bordeaux instead of 100 gal. 8-4-50), reduce the number of sprays (e.g. during dry periods). A method is described for separating the mutually exclusive effects of spray and pest damage when operating on the same plots.

673. VARGAS C., C. 633.491
Nuevas especies de papas silvestres del Perú. **(New wild potato species from Peru.)**
Rev. argent. Agron., 1943, **10**: 396-8.

DAVIES, R. O., FAGAN, T. W., AND JOHN, J. L. 633.491-1.415.1
Requirements of the potato on acidic braken land.
Emp. J. exp. Agric., 1944, **12**: 54-60.

SINGH, B. N., AND WAKANKAR, S. M. 633.491-1.532.2
Effect of spacing and seed size on yield of potatoes.
J. Amer. Soc. Agron., 1943, **35**: 613-6, bibl. 2.

WAKANKAR, S. M. 633.491-1.532.2
Influence of size of seed piece upon the yield of potatoes.
J. Amer. Soc. Agron., 1944, **36**: 32-6, bibl. 5.

COCKERHAM, G. 633.491-2.8
The reactions of potato varieties to viruses X, A, B and C.
Ann. appl. Biol., 1943, **30**: 338-44, bibl. 30.

BAWDEN, F. C., AND SHEFFIELD, F. M. L. 633.491-2.8
The relationships of some viruses causing necrotic diseases of the potato.
Ann. appl. Biol., 1944, **31**: 33-40, bibl. 25.

PAL, B. P. 633.491-2.8
Virus diseases of potatoes in India.
Curr. Sci., 1943, **12**: 279, bibl. 2.

STELZNER, G. 632.8: 633.491
Zur Frage der Virusübertragung durch Samen, insbesondere des X-, Y- und Blattrollvirus der Kartoffel. **(The transmission of virus by means of seeds, with special reference to the X, Y and leafcurl virus of potatoes.)**
Züchter, 1942, **14**: 225-34, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 161.

674. MILLIKAN, C. R. 633.52-2.19: 631.811.4
"Withertop" (calcium deficiency) disease in flax.
J. Dep. Agric: Vict., 1944, **42**: 79-91, bibl. 37.
Withertop disease of flax has been noticed to occur in a number of flax growing districts in Victoria since 1939, causing heavy losses in the Western district and Gippsland. The trouble was found to develop within a few hours in plants 12-15 in. high, which were in a period of rapid elongation and growing in waterlogged soil. The first symptom is the appearance of a bend about 2 in. below the tip, which is soon followed by the dying back of the part above the bend. It was shown by chemical analysis, pot and field experiments that the cause is calcium deficiency. It was completely remedied by an application of 4 tons of limestone per acre.

675. STAFFORD, W. 633.52
Linen flax growing.
N.Z. J. Agric., 1944, **68**: 31-6.
Linen flax is described as a crop to the success of which the grower can contribute more than to any other crop. Advice is given on cultivation and relevant factors in the light of experience gained by Government departments and farmers in New Zealand during the last three seasons. Further pooling of knowledge is considered necessary.

676. COOK, L. J. 633.52
Field trials with flax.
J. Dep. Agric. S. Aust., 1943, **47**: 75-80.
Research work on flax in South Australia has been carried out for some seasons at the Waite Agricultural Research Institute. This paper reports on variety, time of seeding and rate of seeding tests conducted in various districts suitable for flax growing. The two main varieties compared were Concurrent and Linal Crown, both being superior in some places and inferior in others. Mid-season was found to be the best time for sowing, and 75-90 lb. seed in the south and south-east and 60-80 lb. in the north seemed to be the optimum amounts.

677. RUDAKOVA, M. M. 633.52: 581.14
The recognition and forecasting of the early maturity of flax varieties and the sex of the plants based on the theory of cyclic development. [Russian.]
Papers of the State Inst. Agric., Gorkii, U.S.S.R., 1943, 4: 93-121, bibl. 35.
N. P. Krenke's theory of the cyclic phases of aging and rejuvenation in plants, which is thought to supplement that of Lysenko on the phasic development of plants, has been applied by the author of the present article to estimating the periods of time necessary for different varieties of flax to reach maturity, and distinguishing, at the earliest possible stage of growth, between male and female plants. Among the observations which proved most helpful in accomplishing these aims were the length of the internodes, length of the leaf petioles, the rate at which the lower leaves die off, the action of various enzymes, the content of chlorophyll in the leaves situated at various levels along the stem, and the colour of the young seedlings immediately after germination. In the four varieties of flax in which these phenomena were exemplified, all these observations served to distinguish one variety from another in regard to maturity, and the last two to distinguish one sex from

another, within each variety. The colour of the young seedlings, in particular, enabled accurate forecasting in 74 to 78% of cases. The process is said to be applicable to farm conditions.

678. HOFFMANN, W. 633.522
Gleichzeitig reifender Hanf. **(Hemp ripening simultaneously.)**
Züchter, 1941, **13**: 277-83, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 20-1.
Starting from 2 monoecious fertile plants the author succeeded in breeding a hemp in which the percentage of males was reduced to insignificance. 94-96% of the plants ripened at the same time, 75-80% being seed bearers as against a normal 50-55%. The time of flowering of this hemp is somewhat later than that of the usual varieties and the average height is somewhat lower, but fibre quality and yield equals those of the old forms. The final aim of this breeding work is to obtain a genuinely monoecious variety, plants of the present form being only feminized males.

679. WAHLIN, B. 633.522-2.19: 546.711
Några fall av manganbrist sommaren 1943. **(Some cases of manganese deficiency in hemp in the summer of 1943.)**
Växtskyddsnotiser, 1944, Nr. 1, pp. 11-5.
A severe outbreak of manganese deficiency in hemp (*Cannabis sativa*) occurred on a moor soil in Gothland, Sweden. Plants growing near the firm soil or close to the drainage ditches on soil thrown out of the ditch remained healthy. At a distance of 15 m. from the ditch the deficiency symptoms were of medium severity and at a distance of 30 m. they were heavy. The respective pH values were 7·4, 6·4 and 5·9. The latter findings seem to contradict all previous observations that the disorder increases with increasing pH values. Such cases, however, were caused by a surplus of lime rendering manganese unavailable to the plants. The grower controlled the trouble rapidly by applying 40 kg. manganese sulphate per hectare. The deficiency symptoms of hemp, spring wheat and mustard are described as they appear at different degrees of the disease. It was found essential to treat the plants when the soil was moist. Tests on moor soils undertaken by the Plant Protection Station, Stockholm, have so far not been conclusive, but it is suggested that 50 kg. manganese sulphate per hectare is a safe dose.

680. BREDEMANN, G. 633.522
Züchtung auf Fasergehalt bei Hanf (*Cannabis sativa* L.). **(Breeding for fibre content in hemp.)**
Züchter, 1942, **14**: 201-13, from *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 130-1.

681. ROMAGNOLI, M. 633.525
La coltivazione delle ramia nell' Azienda sperimentale dell R. Istituto agronomica per l'Africa Italiana. **(Ramie growing at the Italian Research Station for Africa.)**
Agric. colon., 1942, **36**: 38-46, 74-84, 105-12.
Plantings of several hundred rhizomes of ramie were made at Poggio a Caiano in 1936. Detailed records of environmental conditions and growth for the seasons of 1936 to 1940 are given. There are two chief periods of growth: (1) April to June, 80-85 days, (2) end of June to end of September or early October, 90-100 days; (3) sometimes an autumn growth period October to November, 40-45 days. The best growth is made in June, but with rain it may be as good in July and August. The spring growth usually gives the best production, and climatic conditions are more favourable than in summer. Growth is unsatisfactory when atmospheric humidity is below 60%. Optimum conditions for vegetative growth are not identical with those for flowering and fruiting. The area around Bonistallo may be considered exceptionally good for the production of ramie, but its culture can probably be expanded by the use of irrigation. Complete directions for planting the rhizomes and caring for the plantation are given. The fibre may be decorticated either in the green state or dry, the latter method being preferable where conditions permit drying in advance. Green material must be worked as soon as harvested. No parasites were observed on plants of ramie in five years of cultivation at Bonistallo. G.W.A.

682. RODRIGO, A. DEL P. 633.524.3
Especies de " sida " espontáneas en la Argentina que pueden utilizarse como textiles. **(Species of *Sida* [*Malvaceae*] growing in Argentina which can be utilized as textiles.)**
Rev. argent. Agron., 1943, **10**: 373-7, bibl. 17.
Sida acuta var. *carpinifolia*, *S. cordifolia* and *S. rhombifolia* are described.

683. LIVOV, S. D., AND TAVADZE, P. G. 633.71-1.55
The effect on the upper leaves of picking the lower leaves of tobacco. [Russian.]
Trud. bot. Inst. Akad. Nauk, S.S.S.R., Ser. IV, Eksp. Bot., 1940, No. 4, pp. 194-206.
Experiments with *Nicotiana angustifolia* and *N. abull* carried out both in Leningrad and the Crimea showed that the picking of the lower leaves decreased the content of water and carbohydrates in the upper leaves both absolutely and relatively to the amount of nitrogen present, thereby reducing the quality of the manufactured tobacco. The effect was less pronounced in Leningrad than in the Crimea, where the climate is drier and competition for moisture among the leaves at various levels on the stem is more severe. In similar experiments with sunflowers, the thick stems of which acted as reservoirs of water, picking the lower leaves had scarcely any of the effect upon the upper leaves noticeable in tobacco. The author suggests that the method of gathering tobacco leaves should be reconsidered.

684. ALLARD, H. A. 612.014.44: 633.71
Length-of-day behaviour of *Nicotiana gossei*.
J. agric. Res., 1943, **67**: 459-64.
Photoperiod experiments at Arlington Experiment Farm, Arlington, Va, showed that *Nicotiana gossei* constitutes an exception in the genus in that flowering was greatly hastened by long light periods in winter and delayed by short daily light exposures in summer. Seeds were obtained from Northern Territory, Australia, about latitude 24° S. Incidentally it is noted that the seeds require a pronounced rest period after harvest.

685. GREBINSKII, S. O. 633.71: 581.192
The conditions determining the formation and accumulation of organic acids in *Nicotiana rustica*. [Russian.]
Trud. bot. Inst. Akad. Nauk, S.S.S.R., Ser. IV, Eksp. Bot., 1940, No. 4, pp. 207-35.
This is a study of the processes which are involved in the formation of citric, malic and other organic acids in *Nicotiana rustica*. The age of the plant and of the leaves, the effect of drying and etiolation, were studied in connexion with the acids, as also the relation between them and the ash constituents. The author suggests the probable origin of citric acid in the plant. In the course of the experiments some plants were ringed, and the flower buds of others removed, in order to study the effects of such treatment on the biochemical processes.

686. MCKINNEY, H. H., AND CLAYTON, E. E. 633.71-2.8
Acute and chronic symptoms in tobacco mosaics.
Phytopathology, 1943, **33**: 1045-54, bibl. 17.
The natural course of tobacco mosaic in a given plant involves 2 major phases, an acute and a chronic phase. Investigations on these phases are described and discussed.

687. OFFERMANN, A. M. 633.71-2.8
Determinación del *Nicotiana* virus 1 en tabacos manufacturados y productos insecticidas. **(Identification of *Nicotiana* virus 1 in manufactured tobaccos and nicotine insecticides.)**
Rev. argent. Agron., 1943, **10**: 268-74, bibl. 9.
The technique which eventually proved satisfactory is fully described. Out of 56 brands of tobacco 37 were found to contain the virus. No insecticide was contaminated.

688. SMITH, T. E. 633.71-2.3
Distribution of bacterial wilt (*Bacterium solanacearum*) in successive crops of tobacco grown on the same fields.
Phytopathology, 1943, **33**: 1076-80, bibl. 2.
Uneven distribution of tobacco wilt in N. Carolina fields occurring in similar pattern from year to year is probably associated with permanent soil conditions rather than the random spread of inoculum by cultivation or surface water.

689. KOTTE, W. 633.71-2.654.1
Die durch *Tylenchus dipsaci* Kühn verursachte "Umfällerkrankheit" des Tabaks. **(Collapse of tobacco plants caused by *Tylenchus dipsaci*).**
Z. PflKrankh., 1943, **53**: 37-42, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 133-4.
The collapse of tobacco plants caused by the nematode *Tylenchus dipsaci* is described. The pest is highly specialized and does not present a danger to other crops. The removal and destruction of infested plant parts, both of the stumps on the plot and of the waste in the sheds, is the most important control measure. It is reported that infested plants may, by earthing up, be induced to produce adventitious roots higher up the stem.

690. SCOTT, L. B., AND MILAM, J. 633.71-2.78
Isoamyl salicylate as an attractant for hornworm moths.
J. econ. Ent., 1943, **36**: 712-5, bibl. 4.
Tests in 1941 and 1942 indicate that tobacco infestations by *Protoparce sexta* and *P. quinquemaculata* can be materially reduced by moth traps or poison feeders containing isoamyl salicylate or imitation blossoms of *Datura stramonium*, the odour of the former and the sight of the latter being the attractant. The poison consists of 0·04% of rotenone or 5% tartar emetic. These methods are valuable as a supplementary control.

691. SCHMUCK, A., SMIRNOV, A., AND ILJIN, C. 633.71: 581.192
The changes in alkaloids induced by transplantation in some species of the genus *Nicotiana*. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1942, Nos. 3-4, pp. 7-10.

SCHMUCK, A., ILJIN, C., AND SMIRNOV, A. 633.71: 581.192
The formation of alkaloid anabasine in tobacco grafted on *N. glauca*. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1942, Nos. 1-2, pp. 20-3.

PALIENKO, T. S. 633.71
A new method of cultivation of makhorka (*Nicotiana rustica*) for the production of citric acid. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1942, Nos. 3-4, p. 11.

KÖHLER, E. 633.7-2.8
Über die Resistenzeigenschaften von *Nicotiana glutinosa* gegenüber dem Tabakmosaikvirus. **(The mode of resistance reaction to tobacco mosaic virus in *Nicotiana glutinosa*.)**
Z. PflKrankh., 1941, **51**: 449-62, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 22.

SCHRAMM, G., AND REBENSBURG, L. 633.7-2.8
Zur vergleichenden Charakterisierung einiger Mutanten des Tabakmosaikvirus. **(Comparative characterization of some mutants of the tobacco mosaic virus.)**
Naturwiss., 1942, pp. 48-51, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 22.

692. HARLAN, J. D. 633.79
A trial of new varieties of hops for New York.
Better New York hops, 1941, **2**: 4: 1-20.
As the results of trials at the Experimental Hop Yard, Waterville, N.Y., and of analyses, the following hops are recommended for growing by N. York growers:—English Cluster, Late Cluster, Brewer's Gold and Bullion. Of these the first two originated in the State of Washington, the last two were bred by Salmon of Wye, England, the original female parent being a wild hop from Manitoba. Yields and resin contents are noted for the 10 varieties of hop tested.

693. RABAK, F. 633.79: 663.4
The effect of seeds on the quality of hops.
Commun. Wallerstein Labs., 1943, **6**: 160-6, bibl. 9.
Analysis of 375 samples from different hop growing districts in the U.S.A. consisting of 141 seedless, 131 semi-seedless and 103 seeded commercial hops from crops of 4 successive seasons indicates the existence of a definite relationship between their seed content and quality based on α resin. The presence of seeds would appear to lower the α resin content and impair the value of hops for brewing purposes, and seedless hops would appear to be superior for general brewing purposes.

694. MADUEÑO BOX, M. 633.822
El cultivo de la "Mentha piperita". **(Cultivation of peppermint.)**
Rev. agric. Guatemala, 1943, **20**: 7-9: 35-40.
A fairly full account of the cultivation of *Mentha piperita* taken from a bulletin of the Ministry of Agriculture, Spain.

695. CASTRO, R. 633.842-1.56
Cultivo del pimiento (*Capsicum annuum* L.) y su industrializacion en la provincia de Mendoza. **(Cultivation and industrialization of paprika in Mendoza.)**
Bol. Frut. Hort. B. Aires, 1943, Vol. **8**, No. 87, pp. 62, bibl. 7.
Treats fully of the cultivation, drying and processing of paprika [or red pepper] in Argentina.

696. POPOFF, P. 633.842
Untersuchungen über den Einfluss einiger genetischer und ökologischer Faktoren auf Ertrag und biologischen Wert von Paprika (*Capsicum annuum* L.) unter besonderer Berücksichtigung des Ascorbinsäuregehaltes. **(The influence of some genetical and ecological factors upon yield and biological value of paprika with special reference to ascorbic acid content.)**
Gartenbauwiss., 1943, **17**: 446-92, bibl. 48.
The author has made a thorough study of paprika, the significance of which as a source of vitamins A and C has only recently been recognized. Three ecological groups can be distinguished:—(1) American: vigorous plants, large fruits, ripening late; (2) Bulgarian: medium-sized plants, ripening early to medium-early; (3) Hungarian: small, short plants, medium-sized, mainly erect fruits, ripening early. In Europe, the species is chiefly grown in Bulgaria, both as a vegetable and as a spice plant. The author's investigations are based on 85 Bulgarian varieties cultivated at the Inst. f. Gemüsebau, Grossbeeren, of the Versuchs-u. Forschungsanstalt für Gartenbau, Berlin-Dahlem. The plants were planted out from greenhouses or frames at the beginning

of June, the first harvest being in the second half of July, the last at the end of September. The most successful treatment was to complete the whole life-cycle under glass, i.e. in cold houses or frames. The best variety yielded about 588 cwt. per hectare in the open and about 734 cwt. under glass. The small-fruited *Capsicum* (subsp. *microcarpum*) was the least exacting but yielded satisfactory returns; it had the highest ascorbic acid content at marketing maturity on a fresh weight basis (102·13-210·70 mg.%) and the lowest on a dry weight basis (908·9-1,377·6 mg.%) as against 43·50-125·78 mg.% and 725·2-1,667 mg.% respectively of the large-fruited varieties. The ascorbic acid content increased between market ripeness and full maturity. There was no relation between fruit colouring and ascorbic acid content, which, however, in yellow varieties decreased with complete ripeness. Neither was there a relation between capsaicin and ascorbic acid. The carotene content of fully ripe pods, being related to fruit colouring, varied largely (0·04-23·3 mg.%). The carotene content increased between marketing and full maturity and even after that, both relatively and absolutely. Other values, such as dry matter, total and protein nitrogen and monosaccharides, were also determined.

697. CARRERA, C. J. M. 633.842-2.411
Estudio sobre la fisiologia de la *Phytophthora capsici* Leonian productora del mildiu o tizon del pimiento en la Argentina. (**A physiological study of *Phytophthora capsici*, the causal fungus of stinking smut or mildew of pimiento in Argentina.**) [English summary.]
Rev. Fac. Agron. B. Aires, 1942, **10**: 156-93, bibl. 45.

GODOY, E. F. 633.842-2.411
El "mildew" o "tizón" del pimiento producido por la *Phytophthora capsici* en la República Argentina. (**Mildew of pimiento caused by *Phytophthora capsici* in Argentina.**) [English summary.]
Rev. Fac. Agron. B. Aires 1939, 1940, **24**: 235-80, bibl. 27.

698. REGEL, C. 633.85
Beiträge zur Kenntnis von mitteleuropäischen Nutzpflanzen. II. (**Economic plants of Central Europe. II.**)
Angew. Bot., 1941, **23**: 137-51, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 76.
The possibility is discussed of cultivating a number of wild oil, fibre and rubber yielding plants under central or north-eastern European conditions. The review is based partly on Russian data and partly on the author's own work.

699. ŽEMBROVSKĬ, I. M. 633.85
Twenty years of agricultural research in Kazahstan. [Russian.]
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljjamas, 1940, No. 9-10, pp. 3-7.
The oil-bearing crops now grown in Kazahstan are the castor-oil plant, sesame, safflower, and mustard. An improved variety of melon, the Kara-Guljebi, has been produced which may be stored during the winter.

700. BLACKMAN, G. E. 633.85
Sunflowers as an oil seed crop.
Agriculture, 1944, **50**: 517-21.
Tests to discover the best methods of growing sunflowers under English conditions have been carried out at the Imperial College, London. From variety trials with seed from other sunflower producing countries 3 early maturing varieties were eventually selected, namely Pole Star, Southern Cross, and Mars. To gain wider experience in growing the crop on a farm scale and to provide seed supplies for 1944 stock, seed was distributed to some 20 farmers in Southern England in 1943. Of the detailed instructions worked out in the course of the investigation, a few may be mentioned. Most soils are suitable, but early sowing (end of March-first week of April) is necessary to ensure early maturity, an essential in view of the humid autumns. The best spacing was to single the young plants to about 12 in. apart in the row with the drills 18 in. apart to allow of horse-hoeing. Two methods of drying are described: (1) stooks built with plants instead of sheaves, (2) placing the plants against a wire with the heads hooked over it, facing downwards, several rows deep. In discussing the virtues of different threshing machines the particular suitability of the maize sheller is emphasized, which dispenses with preliminary stooking. According to soil, yields of 10-20 cwt. per acre may be expected. The oil and protein content of ripe seeds on a dry weight basis are 30-36 and 17-20% respectively. Decorticated seeds are fit for human consumption. Loss of seed from the ripening head by bird depredations is the main source of damage.

701. DE FINA, A. L. 633.85
Aclaración sobre los movimientos florales del girasol. (**Floral movement of the sunflower.**)
Rev. argent. Agron., 1943, **10**: 276-8, bibl. 2.
A study of the heliotropic movement of sunflower heads showed that while the flower head was in the green stage and unopened it followed the sun from east to west, through north (southern hemisphere), returning to the east after sunset. As the flower gradually opened the movements diminished and ceased entirely at anthesis with the majority of the heads turned more or less to the east. Movement was particularly marked on the axillary heads, ceasing as before on anthesis. Both terminals and axillaries turned eastwards with more apparent ease than to the west. Movement, though less pronounced, occurred also on sunless days. Other observations were to the effect that the terminal opened first and the axillaries in strict rotation from the top downwards. Anthesis began at the periphery of the flower head and progressed regularly inwards. Stamens and stigmas stood out conspicuously from the floral tube, their subsequent occlusion being accomplished by the shrivelling of the filaments and the contraction of the style. The whole process of projection and retraction was complete in 3 days, the extruding movement being completed on the first day.

702. LARMOUR, R. K., SALLANS, H. R., AND CRAIG, B. M. 631.531: 581.192
Hygroscopic equilibrium of sunflowerseed, flaxseed, and soybeans.
Canad. J. Res., 1944, **22**, Sec. F, pp. 1-8, bibl. 4.
Equilibrium moisture values for relative humidities of from 31 to 93% were obtained for sunflowerseed, flaxseed, and soybeans. The hygroscopicity of whole sunflowerseed *per se* is practically the same as that of flaxseed, that of dehulled sunflowerseed is somewhat lower. Soybeans show a hygroscopicity curve quite different from that of flax and sunflowerseed. The differences in these curves are not explainable by either the oil or the ash contents of the seeds. [Authors' summary.]

703. LARMOUR, R. K., SALLANS, H. R., AND CRAIG, B. M. 631.531: 581.12: 633.85
Respiration of whole and dehulled sunflowerseed and of flaxseed.
Canad. J. Res., 1944, **22**, Sec. F, pp. 9-18, bibl. 4.
The effects of various moisture contents on carbon dioxide production of whole and dehulled sunflowerseed and of flaxseed were studied. The safe moisture limit for straight grading of whole, undamaged sunflowerseed intended for bulk storage was estimated to be 9·5%; for dehulled sunflowerseed it appears that 6% must be regarded as a maximum moisture for safe storage. [Authors' summary.]

704. ANDERSON, J. A., AND OTHERS. 633.85
Oil seeds in western Canadian grain screenings.
Canad. J. Res., 1944, **22**, Sec. F, pp. 19-27, bibl. 2, being *Pap. Grain Res. Lab.* **57** and *Pap. Ass. Comm. Grain Res.* **220**.

An examination of the weed seeds in refuse screenings from cereal grains led to the conclusion that oils of superior quality could be obtained only by segregating the seeds of various types. Existing machinery could probably deal effectively with wild mustard seed only. It is estimated that the extraction of mustard seeds from refuse screenings in Canada would produce 1,400,000 lb. mustard seed oil annually; the crushing equipment available, however, is not adequate for handling such large amounts.

705. CLOPTON, J. R., AND TRIEBOLD, H. O. 633.85
Fanweed seed oil. Potential substitute for rape seed oil.
Industr. Engng Chem. (*Industrial Edition*), 1944, **36**: 218-9, bibl. 9.

The seeds of *Thlaspi arvense* (fanweed or pennycress) are found to contain 33 to 35% oil by weight. The consistency of this oil, which is very similar to that of rapeseed and might, it is thought, take its place as a lubricant constituent and for other purposes, is discussed.

706. ANON. 633.85
Die Bedeutung des Rizinus als Ölpflanze. **(The significance of the castor oil plant as a source of oil.)**
Forschungsdienst, 1943, **16**: 195-6.

The acreage devoted annually to the cultivation of castor oil plants in Europe, excluding Russia, increased from 1,000 hectares in 1924-8 to 17,000 hectares in 1939. Russia is reported to have produced castor oil plants on 228,000 hectares during the last years before the war. The many uses to which the oil is being put are noted. The residues, which until recently were merely used as fertilizers, are now detoxicated and represent a valuable stock feed, rich in proteins. The problem of producing plastic materials and fibres from these proteins has also been solved. In Hungary a variety, Mauthner's early spineless castor oil plant, has been bred, which may be considered as coming up to the standard of a cultivated variety. Its distinctive characters are moderate vegetative development, spineless sporocarp and early maturity.

707. ANON. 633.854.797
Safflower as an oil-yielding plant.
Int. Rev. Agric. Rome (*Mon. Bull. agric. Sci. Pract.*), 1942, **33**: 380T-4T, bibl. 4.

Data on safflower, *Carthamus tinctorius*, as an oil-yielding plant. It makes few demands on soil and climate and produces larger quantities of excellent oil per acre than sunflower.

708. GOFFART, H., FREY, W., AND EXT, W. 633.85-2.76
Grossbekämpfung des Rapsglanzkäfers (*Meligethes aeneus* F.) mit Derrisstäubemitteln in Ostholstein. **(The control of the rape pest *Meligethes aeneus* in the field.)**
Z. PflKrankh., 1942, **52**: 113-31, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 67-8.

In a large-scale trial in East Holstein, Northern Germany, dusting with a low percentage derris preparation gave superior control of the rape pest *Meligethes aeneus* to catching the beetle by improved mechanical devices.

709. BAN'KOVSKI, A. I., AND MURAV'EVA, V. I. 633.859
A new source of morphine. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1942, No. 1-2, pp. 33-5.

After examination of various types of oil poppy, it was found that morphine was present in the dry seed-heads left after the removal of the seed, in amounts ranging from a mere trace to 1·2% of the dry matter. From a yield of 7 centners of seed-heads per hectare, containing, say, 0·5% morphine, 2 or 3 kg. of this alkaloid may be extracted, an amount which exceeds that obtainable from opium. Some of the poppy seed-heads yielded as much as 14 kg. of opium per hectare, containing between 8·5 and 18·5% (usually 14 to 15%) of morphine. The seed-heads also contained 40 to 50% of oil; some types yielded [illegible] more. In addition to morphine, the seed-heads were found to contain narcotin, codein, hebain and papaverin. Analysis of the seed-heads, leaves and stems showed that the seed-heads yielded the most morphine, which was present in the largest amounts when the plant was fully ripe. Nevertheless, the leaves and stems contained enough to suggest the possible use of the whole plant as a source of supply. There is great diversity in composition among the poppies studied and they should be full of promise to the plant breeder.

710. KÖNEMANN, E. 633.85
Ölfruchtbau in allen Lagen. Anbau, Bedeutung und Verwertung. **(The growing of oilfruits in all parts of Germany. Cultivation, significance and utilization.)**
Siebeneicher Verl., Berlin, 1942, pp. 95, RM. 2.80, from review *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 86.

MARENGO, L. V. 633.85-2.48
Fusariosis del girasol (*Helianthus annuus*). **(A disease of sunflower due to *Fusarium solani* var. *minus*.)**
Rev. Fac. Agron. B. Aires, 1942, **10**: 130-47, bibl. 44.

711. BAUER, K. H., RUDORF, W., AND HEEGER, E. F. 633.88
Die Anbauverhältnisse einiger Heil- und Gewürzpflanzenarten unter besonderer Berücksichtigung der Wertstoffgehalte. **(The cultural requirements of some medicinal and spice plants with special reference to their content of valuable substances.)**
Landw. Jb., 1942, **92**: 1-52, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 87.

The most suitable soil and climatic conditions were studied for marjoram, coriander, mustard, caraway, peppermint and valerian.

712. GUSYNIN, I. A. 633.88
Results of laboratory and clinical investigations into the use of buttercups as medicinal plants. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1942, No. 3-4, pp. 41-5.

Protoanemonin, being a volatile substance, may be extracted from various species of buttercup by aqueous distillation of freshly gathered plants. It occurs in largest amounts during the period of full flowering and seed formation. It has been found to be an effective antiseptic, which facilitates the healing of wounds.

713. BELOV, M. G. 633.88
Cultivating wild colonies of *Artemisia absinthium* [wormwood] by means of machinery. [Russian.]
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljjamas, 1940, No. 7-8, pp. 8-10.

Artemisia absinthium, a source of the vermifuge santonin, may be used as such, or in the form of the dried inflorescences collected when half open. The plant, a perennial growing to a height of 20 to 60 cm., belongs to the *Compositae*. Yields of the dried inflorescences from wild colonies of the plant amount to no more than 50 to 70 kg. per hectare, though it is believed that under cultivation they might be increased to 500 kg. or more. In the experiments

described the plants were growing in sets in rows, with intervals between sets of 50 cm. and between rows of 30 cm. Cultivating between the rows in autumn and harrowing in early spring are considered to suit the crop.

714. Ruano Grajeda, V., and Francisco Franco, O. 633.88.51
Virtudes curativas de una flor. **(The periwinkle as a cure for marsh fever in Guatemala.)**
Rev. agric. Guatemala, 1943, **20**: 7-9: 34.
An infusion of the fresh flowers of the periwinkle made with boiling water and drunk is reported as a specific for so-called marsh fever. [The exact species meant is not clear. The scientific name given is *Vinca pervinca* but the illustration shows the plant to be erect and bushy.—Ed.]

715. Hopkins, J. C. F. 633.88
Summarized instructions for collecting stramonium.
The Art Printing Works Ltd., Salisbury, S. Rhodesia, 1943, pp. text 2, plates 5.
See also *H.A.*, 14: 224.

716. Martin, G. 633.913
Competitive rubber plants.
Nature, 1944, **153**: 212-5.
In this paper, read before the Royal Society of Arts on 14 December, 1943, an account is given of the more important rubber-bearing plants, with special reference to the limitations which render their competition with *Hevea* improbable. *Taraxacum officinale*, the dandelion, contains rubber, but only to the extent of 0·2% per plant. *Taraxacum kok-saghyz*, the Russian dandelion, produces 10% of rubber but tens of thousands of acres would be necessary to produce 1,000 tons of rubber or 1% of our imports prior to 1939 and good agricultural land in England could not be spared. *Euphorbia tirucalli* of South Africa yields 2 gallons of latex per day per tapper, producing at most 1 lb. of rubber of fair quality. The mechanical difficulties of purification are considerable. The coagulated latex, "Niger paste", of the vine, *Carpodinus hirsuta*, contains over 10% of rubber hydrocarbon and is useful because it can be used without purification in certain directions as a substitute for a corresponding proportion of good rubber. The West African forest tree *Ficus vogelii* yields a product full of impurities but containing 50% rubber hydrocarbon which can be used where a high proportion of rubber is not required. The shrub, *Parthenium argentatum*, guayule, in California has competed unsuccessfully with *Hevea* for 20 years, although backed by intense scientific and practical study. The woody climber, *Cryptostegia grandiflora*, from Madagascar has recently been planted to the extent of 100,000 acres in Haiti [*H.A.*, 14: 349], and also in India and Australia. It grows rapidly and can be tapped the first year, which is done by bunching the ends of the shoots together, cutting off an inch and immersing the cut ends in a container, the small coagulation which seals the end of each shoot being collected later. Certain plants yielding reasonable amounts of good quality rubber and commercially exploited until pushed into retirement by the economic predominance of *Hevea* are staging a temporary come-back. The most important is the tropical African *Funtumia elastica*, but it has to be tapped up as high as 60 ft., shows decreasing yield, will die if over-tapped, is more or less solitary (2 or 3 to the acre in forest), and to yield 10 lb. of latex or the minimum daily output of a *Hevea* tapper in Malaya 40 trees would have to be tapped. A few abandoned commercial plantations exist and these are being worked. *Manihot glaziovii*, Ceara rubber, of Brazil can be grown 300 to the acre as against the 100 or less of *Hevea*, is less exacting as to environment and can be tapped in 2 years from seed, but the annual yield, 200 lb. per acre at most, compares badly with *Hevea* and the tree is difficult to tap. Individual trees will yield at the rate of 3,000 lb. per acre so that the possibility of producing high yielding strains exists. Abandoned Ceara plantations in East Africa have been reopened. The woody West and East African climbers, *Landolphia* spp., contain from 85% to 90% hydrocarbon but are slow growing. The vines have to be climbed for tapping, the yield is from 1 to 8 oz. of rubber, and the plant cannot be tapped again for several months. For wild *Landolphia* 1 lb. of rubber per acre would be a high yield. *Landolphia tholloni*, Equatorial Africa, throws out a mat of stems just under the soil surface, reaching to 60 yards in length and easily cut off and collected. The bark contains 15% of rubber, but extraction from the gathered stems is hard and 15 hours' beating by hand is required to extract 1 lb. of rubber. A mechanical grinder would solve the difficulty and a suitable type is suggested. *Castilloa* and *Ficus elastica* have both been cultivated on a small scale but yields are low.

717. Millington, A. J. 633.913
Rubber production in relation to Western Australia.
J. Dep. Agric. W. Aust., 1943, **20**: 196-200.
Cultivation tests with the guayule (*Parthenium argentatum*) have been started at a number of places in Western Australia. 37% germination was obtained after seed treatment with 4% hypochlorite for 6 hours.

718. Bonner, J. 633.913: 581.036
Effects of temperature on rubber accumulation by the guayule plant.
Bot. Gaz., 1943, **105**: 233-43.
The rubber content of greenhouse grown guayule, *Parthenium argentatum*, was low and could not be increased by drought of varying degrees, deficiency of nitrogen to varying extents or day length. An increase of 0·7-1·0% of rubber over a period of one month was, however, obtained when plants were subjected to an 8-hour day at a temperature of 80° F. and a 16-hour night at 40°-45° F. and the increase was maintained. Night temperatures of 55°-60° produced no response. Older plants, which had already passed one winter in the field, were more effective in rubber accumulation than the young plants but they, too, responded to low night temperatures in a manner qualitatively similar.

719. Neuman, G. B. 633.913-1.8
Effect of cultivation upon the quality of rubber in kok saghyz roots. [Russian.]
Proc. Lenin Acad. agric. Sci., U.S.S.R., 1941, No. 9, pp. 12-3.
Intensive manuring greatly increased the nitrogen content of kok saghyz, high nitrogen and high potassium lowered the rubber content, phosphates raised it in moist years but lowered it in very dry years. The highest rubber content is produced by a combination of N and P in the proportion 1: 1. Nitrogen tends to reduce the amount of sugars, P and K to increase it. These effects can be explained by the effect that nitrogen has in stimulating leaf development, which tends therefore to reduce the stores in the root. The best rubber quality is only obtained with full mineral manuring in addition to dung; phosphates invariably improve the quality and potash seems to have the same effect. Wide spacing also improves quality. Results are tabulated.

720. Hamner, C. L., and Marth, P. C. 577.15.04: 633.913
Effects of growth-regulating substances on propagation of golden rod.
Bot. Gaz., 1943, **105**: 182-92, bibl. 2.
Stolons and cuttings of selected clones of the rubber-bearing *Solidago leavensworthii* were treated with various growth substances at Beltsville, Maryland, Bureau of Plant Industry. Treatment with indolebutyric, naphthaleneacetic, naphthoxyacetic acids, naphthalene acetamide, or a mixture of all four for 3 hours at 10 or 50 p.p.m. gave some increase in rooting over the controls. The greatest number and quantity of roots was formed when the substrate temperature was from 70°F. to 80° F. and 3-inch stolon sections gave

many more roots and heavy top growth and a much higher percentage of rooting than ½-inch pieces. The most successful stem cuttings were taken from the young tips rather than from mature stems, and the treated ones produced roots more abundantly than the untreated.

721. HARVEY, R. B., AND LEE, S. L. 632.654.1: 633.913
Flagellates of laticiferous plants.
Plant Physiol., 1943, **18**: 633-55, bibl. 10.
Twelve species of latex producing plants are newly reported as hosts of latex flagellates. Of the commercial rubber plants they are reported only from *Cryptostegia grandiflora*, *Funtumia elastica* and *Taraxacum kok saghyz*. Their interest lies in their possible effect on the quality of the latex and in the fact that they are suspected of power to produce tropical ulcers in man and animals. The article is illustrated by 14 micro-photographs of the organisms.

722. BARANOVSKY, A. L., AND MAKAREVITCH, T. N. 633.917: 575(47)
The spindle tree (*Euonymus europea*) a valuable gutta-percha bearing plant. [Russian.]
Proc. Lenin Acad. agric. Sci. U.S.S.R., 1942, No. 3-4, pp. 23-5.
Euonymus europaea L. has been found to contain up to 13·5% of gutta-percha in the root cortex and up to 10% in the stem cortex. This species is regarded as a more promising subject for breeding than *E. verrucosa* Scop.

723. GALKIN, K. A. 633.956
Camphor basil (*Ocimum canum*) in the Gorki province, and the chemistry of its ethereal oil. [Russian.]
Papers of State Inst. Agric. Gorkii, U.S.S.R., 1943, **4**: 187-221.
Although the natural habitat of *Ocimum canum* is in tropical Africa, eastern India, and South America, it has been grown successfully, as an industrial crop, in the Crimea, Ukraine, and even as far north as Gorki. In the Crimea, two cuts may be obtained during the summer from one crop. The total weight of foliage and the quantity of ethereal oil produced from the first cut are smaller than from the second; and the total yield of two cuts is larger than that of one cut late in the season. Further north, only one cut is obtainable. Near Gorki, the crop is first grown in frames and later planted out. Camphor is a constituent of the ethereal oil which is secreted in glands, to be found in all parts of the plant, but mostly in the leaves and inflorescences. The content of camphor rises to its maximum towards the end of the season; and though it varies from year to year, no conclusive evidence has yet been found to show that the yield of it from plants grown near Gorki is consistently smaller than from those grown elsewhere. Not much is yet known about the effect of different methods of cultivation and management on the yields. According to one experiment, mulching with peat, and the application of NPK manures were noticeably beneficial. There are two " races " of camphor plants, morphologically identical, but differing from one another in their chemical constituents. Most of the article discusses in considerable detail the chemistry of these constituents.

724. WOODMAN, R. M., AND PAVER, H. 635.12: 631.84
The effect of time of application of inorganic nitrogen on the turnip.
J. agric. Sci., 1944, **34**: 49-55, bibl. 4.
The experiments described were made on Milan Strap-leaved Purple Top turnip in sand culture under glass at the School of Agriculture, Cambridge. Nitrogen was applied as sodium nitrate. From the results obtained it seems desirable, if a high yield of roots is required, to apply the nitrogen early and, for a high yield of tops, to apply the nitrogen as post-seedling dressings.

725. BOND, T. E. T. 635.12: 632.4
White spot of turnips: a disease new to Ceylon.
Trop. Agriculturist, 1942, **98**: 4: 17-8, bibl. 7.
An account is given of a disease of turnips known as white spot, *Cercosporella brassicae*. The disease, though known in Britain, is new to Ceylon. The symptoms are an intense marking of the leaves with brown or purple circular spots seldom exceeding ¼ in. in diameter, later becoming bleached white in the centres. Control is by picking off the leaves as they become affected or by spraying the plants with a copper emulsion. The disease, judging from its sudden origin, probably arose from infected imported seed.

726. WRIGHT, D. W., PETHERBRIDGE, F. R., AND ASHBY, D. G. 635.13: 632.77
The biology and control of the carrot fly.
Agriculture, 1944, **51**: 11-5.
The control of the carrot fly, *Psila rosae*, by cultural methods and chemicals has been studied at the School of Agriculture, Cambridge. Cultural methods consist in growing carrots less frequently in the rotation (where practicable), in postponing sowing until the end of May and later and in lifting the crop in October or November. Early carrots, acting as a fertile source of second generation flies, should be grown as far away from the main crop as possible. Early lifting is important, because one-half of the maggots present will be removed with the crop and 80% of the remainder will perish from starvation. The edges of carrot fields, which provide shelter for the flies, should be kept well trimmed and clear of bottom vegetation. Chemical control measures recommended after experimenting for a 3-year period are based on the sheltering habit of the flies in hedges, dyke sides, etc., round carrot fields. These sites were sprayed with a poison bait containing 0·8% sodium fluoride and 2·5% molasses. Some 6 applications at 3-4 day intervals, delivered through coarse nozzles at a pressure of 200-300 lb. per sq. in., were required for the first generation of flies and about 10 applications for the second generation. The kills obtained were very high, with a subsequent material reduction in infestation. (Further particulars of this treatment are given in *Ann. appl. Biol.*, 1944, 30: 348; *H.A.*, 14: 727.) Comparative tests showed the advantage of clamping carrots. It was found that mature carrots clamped in late October or early November did not suffer any further damage for the next 3 or 4 months, whilst the losses through maggots, when the carrots were left in the soil, were at least doubled and additional damage was done through frost. In March or early April the soil under carrot clamps should be treated with naphthalene (4 oz. per sq. yd.) or creosote sawdust (equal parts by weight, well mixed, 2 lb. per sq. yd.). The latter prevents normal plant growth for 5-6 months. Formalin proved ineffective.

727. PETHERBRIDGE, F. R., AND WRIGHT, D. W. 635.13: 632.77
Further investigations on the biology and control of the carrot fly (*Psila rosae* F.).
Ann. appl. Biol., 1944, **30**: 348-58, bibl. 4.
Creosote sawdust mixture (1: 1) applied to the soil in early April at the rate of 2 lb./sq. yd. was completely successful against the pupae in the soil. Clamped carrots suffered much less than those left in the ground. Some 6 months is needed for the phytocidal action of creosote to disappear from the soil.

728. ANON. 635.13: 632.954
Weed control in carrot crops. A preliminary note and warning.
J. Dep. Agric. Vict., 1943, **41**: 575-6.
The method of controlling weeds in carrots by means of selective sprays, recently developed in America, was tested by the Department of Agriculture, Victoria, Australia. Although the experiments are not yet complete it can be stated that power kerosene proved satisfactory, giving the

best results of all oils tested. The spray should be applied after the carrots have developed two true leaves and at least three months before harvesting. Where the rows are more than 12 in. apart it was found economical to destroy the weeds by cultivation and to spray the remaining strips. Where the rows are obscured by weeds or closer than 12 in. it is cheapest to spray the whole plot. It is claimed that in a weedy country spraying with power kerosene will reduce the labour required for weed control to one-fifth or even one-tenth. Sprayed carrots were found to develop more vigorously than those on a hand-weeded plot. The following warnings were necessary: (1) The selective power of imported kerosene varies, some supplies damaging the crop, hence test before use. (2) Carrots sprayed before the two-leaf stage will suffer badly. (3) Carrots sprayed within 3 months of harvest will retain a flavour of kerosene. (4) The volume of spray mixture must be carefully determined. Too little will have no effect, too much will damage the crop. The amount recommended for strip spraying in 18-in. rows is 20-40 gal. per acre, for area spraying 80 gal.

729. KLAWITTER, G., AND V. SENGBUSCH, R. 635.13

Züchterische Untersuchungen des Aufbaues, der Färbung, des Refraktometerwertes und des Geschmacks von Speisemöhren. **(Investigations on the structure, colour, refractometer value and taste of table carrots.)**
Züchter, 1943, **15**: 44-6, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 159.

KLAWITTER, G., AND V. SENGBUSCH, R. 635.13: 631.523

Zielsetzung und Probleme in der Speisemöhrenzüchtung. **(Aims and problems in the breeding of table carrots.)**
Züchter, 1943, **15**: 16-22, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 159.

KÜSTER, E. 635.13: 632.19: 581.46

Zur pathologischen Morphologie der Blüten und Blütenstände. 1. Die Mohrenblüten von *Daucus carota*. **(The pathological morphology of flowers and inflorescences. 1. The black flowers of *D. carota*.)**
Z. PflKrankh., 1942, **52**: 373-82, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 100.

WATKINS, T. C., AND MINER, F. D. 635.13: 632.77

Flight habits of carrot rust flies (*Psila rosae*) suggest possible method of control.
J. econ. Ent., 1943, **36**: 586-8, bibl. 4.

730. CRANE, M. B., AND MATHER, K. 635.15: 581.162.3

The natural cross-pollination of crop plants with particular reference to the radish.
Ann. appl. Biol., 1943, **30**: 301-8, bibl. 1.

Experiments carried out at the John Innes Horticultural Institution in 1941 and 1942 with the distinct radish varieties Icicle and Scarlet Globe, strong populations of hive bees being close at hand, showed that when there is a profusion of flowers individual bees confine their activities to a very small area, probably less than 4 to 5 sq. yds. In closely planted experiments the amount of inter crossing ranged from 30-40% at a distance of 9 in. to an average of about 1% at 15 ft. When grown in quantity and with bees in close proximity a spacing of 300 ft. between varieties should form a complete protection against intervarietal crossing. If small quantities are grown the distance should be greater. Applying these results to fruit growing it will be seen that, when self- or partly self-incompatible fruit trees are grown, it becomes of importance to plant a sufficient quantity of interpollinating varieties to make ample provision for cross pollination and it is essential that such trees should be systematically and regularly distributed throughout the plantation, selecting varieties that flower simultaneously and avoiding those prone to biennial bearing.

731. WOODMAN, R. M. 635.15: 631.8

The nutrition of the radish.
Ann. appl. Biol., 1943, **30**: 319-22, bibl. 4.

At the Horticultural Research Station, Cambridge, sand-culture experiments with radish showed that optimum concentrations of nitrogen for root development were the highest employed (32·96 and 65·92 p.p.m.), that a low concentration of phosphorus (here 2·05-4·09 p.p.m.) was to be preferred and that the high concentration of potassium used (22·44 p.p.m.) gave the largest roots. Deficiency of nitrogen gave poor growth and of potassium a reduced root size and yield. As little as 10 p.p.m. of phosphorus gave a marketable root. The absence of boron from an otherwise satisfactory solution gave a radish of eatable size, but of poor colour, tap rooted shape and little swelling ability. Evidently the radish seed must contain boron.

732. FERNANDO, M. 635.15: 631.531

Radish seed production.
Trop. Agriculturist, 1943, **99**: 86-90.

The European and Indian radish, though both varieties of *Raphanus sativus*, differ markedly from each other. The Indian variety thrives in Ceylon from sea level to over 6,000 ft. It is suggested that because of rising costs and short supply of imported seeds nurserymen in Ceylon might grow their own seed of the Indian variety for local resale. The method of sowing for seed production at the Matale Vegetable Seed Station is described. Holes spaced 3 ft. apart and measuring 9 in. (deep) by 12 in. by 12 in. are manured with compost at the rate of 15 tons per acre. Four seeds are sown on each site, one central, the others disposed round it in a triangle with a 6-inch side. The plants are weeded 2, 10, and 17 weeks after sowing and are earthed up 6 and 10 weeks after sowing. Marketable roots can be lifted 4 to 5 weeks after sowing; the yield should be 10,000 roots per acre. By flowering time, about the 45th day, all the hills should have been thinned to a single plant. In the 11th week the plants are staked. The seed harvest is taken when the plants are 14 weeks old and the seed is hard and cannot be crushed between thumb and forefinger. Harvest should be delayed until the seed at the tips of the racemes is fully mature. The whole plant is then lifted, the roots cut off and burned and the tops sun dried on a flat surface till the pod walls turn brittle. To thresh, the seed is trodden by the labourer, winnowed, hand-sorted and dried again before storage. To maintain a select strain for his own sowing the grower should select, when thinning, a number of the best roots and transplant them firmly 3 ft. apart in prepared soil after cutting the rosettes to reduce transpiration; 500 such roots should provide seed to sow 1 acre. To avoid cross pollination there should be no cruciferous seed crop within a mile.

733. MANTEL, E. 635.15: 631.84

Die Wirkung verschiedener Stickstofformen auf den N-Stoffwechsel bei Rettich im Gefässversuch. **(The effect of different forms of nitrogen on the N-metabolism of black radish grown in containers.)**
Bodenk. PflErnähr., 1941, **24**: 342-56, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 37.

Black radishes grown in sand received as their source of nitrogen a basic application of calcium nitrate and later top dressings of calcium nitrate, ammonium sulphate or sodium nitrate. The last was found to produce the highest yields and to be best utilized, the plants having taken up 78-79% at the time of the third harvest. The nitrate content of the roots amounted to up to 50% of the total nitrogen, reaching or even surpassing the protein N-content in the nitrate series. For protein production NO_3 proved better than NH_4.

734. Wells, S. P. 635.262+633.822+635.63+635.15
Four little cultures, garlic, mint, gherkins and frame radishes.
Fruitgrower, 1944, **97**: 262-4.
Useful instructions for commercial cultivation.

735. Stelzner, G. 635.24: 581.144.3
Entwicklungsphysiologische Untersuchung über die Schosshemmung an Knollen von Topinambur (*Helianthus tuberosus*). **(Physiological investigations on arrested shoot development in tubers of the Jerusalem artichoke.)**
Pflanzenbau, 1941, **18**: 150-7, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 40.
Whereas young Jerusalem artichoke tubers are very frost susceptible up to the end of October (−2° to −3° C.), they become frost resistant after the completion of the herbaceous growth period. If the tubers are stored at high temperatures after harvesting they lose their capacity for normal sprouting. Such a developmental check does not occur if the tubers are stored at low temperatures. 1·3° C. was found to be the best temperature for rapid sprouting and for the removal of a developmental check induced by storing at higher (+14° C.) or lower (−5·3° C.) temperatures. The experiments were carried out at the Erwin-Baur-Inst., Müncheberg, Germany.

736. Nazarov, A. A. 635.24
The Jerusalem artichoke. [Russian.]
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljjamas, 1940, No. 3-4, pp. 30-5.
Helianthus tuberosus will grow almost anywhere in the U.S.S.R. except in the north. Its vigorous root system enables it to withstand drought and make fuller use of soil nutrients than potatoes and forage beet, yet it responds generously to manuring and fertile soil. The yield of its stems and leaves may be between 10 and 60 tons per acre; these may be fed to livestock green, as hay or as silage. The amount of digestible proteins in the foliage exceeds that in maize (with germ) and in spring vetch in full flower, and is itself exceeded only by that in clover hay. The content of cellulose is only one-quarter or one-third of that in good meadow hay, and the effective starch equivalent 37·3. The tubers also provide food for livestock, as well as sugar and alcohol for industrial purposes. The yield may be as much as 100 tons per ha., and the tubers mature late in autumn, when work at the factories is diminishing; they may, if desired, be left in the ground until spring, thus avoiding trouble in storage and improving in quality. Not only the yield of tubers but the proportion of dry matter (28%) per hectare exceeds those of potatoes and forage beet. Though the Jerusalem artichoke is reputed to produce seed with difficulty, at Alma-Ata seed of 80 to 90% germination was produced by breaking down the divisions between the membranes at the tops of the seeds, so enabling the breeding of new varieties to proceed.

737. Heath, O. V. S. 635.25
Studies in the physiology of the onion plant. I. An investigation of factors concerned in the flowering ("bolting") of onions grown from sets and its prevention. Part I. **Production and storage of onion sets, and field results.** Part II. **Effects of day length and temperature on onions grown from sets** [and general discussion].
Ann. appl. Biol., 1943, **30**: 208-20, bibl. 8, and **30**: 308-19, bibl. 7.
I. The investigation concerns the effects of five factors upon the tendency of onion sets to bolt and the production and ripening of bulbs. The factors studied fall into three categories: (1) conditions under which seedlings were grown to produce sets, (2) conditions of storage of sets during dormancy, (3) conditions of growth during the second season. The first comprised sowing date of seed (day-length and temperature effects) and temperature of growth while forming sets; the second, high- and low-temperature storage for different periods and throughout the winter; the third, temperature and day-length during the second season. Field trials and experiments with controlled environment were carried out. The main results of the former were as follows: Large sets were much more liable to bolting than small. Sets produced at high temperature under glass were practically free from bolting when grown on, irrespective of the storage conditions. Storage throughout the winter (22 weeks) at 30° C. practically eliminated bolting; 30° C. for the *first* 8 weeks reduced bolting but given for the *last* 8 weeks was much less effective. Cold storage (0° C.) throughout or for the *first* 8 weeks considerably reduced bolting, but when given for the *last* 8 weeks tended towards increase. High-temperature storage leads to loss in weight; the maximum loss in any treatment, 75%, was associated with 77% mortality in the field. This detrimental effect on survival is confined to sets produced at high temperature (which require no heat treatment as they have no tendency to bolt), while sets produced at lower temperatures show no high mortality during or after high-temperature storage. The reduction in bolting following high-temperature storage is not due to water loss by the sets. High temperature of storage throughout or for the last 8 weeks delayed ripening of the bulbs, and resulted in larger yields; no such effect was obtained by high-temperature storage during the first 8 weeks. [Author's summary.]
II. This paper completes the survey of the effects of 5 factors on flowering behaviour, bulbing and ripening of onions grown from sets and deals with factors of day-length and temperature in the second season. In this season both long days (16 hours) and high temperature encourage bulbing and prevent bolting; thus late planting of sets in the field reduces bolting, but unfortunately results in reduced bulb size. Short days inhibit bulbing but allow of bolting if the temperature is not too high (say 60° F. maximum). With bulbing onset leaf emergence ceases immediately at high (say 70° F.) or soon at moderate temperatures (60° F.) both for seedlings and plants grown from sets. It is therefore important for large bulb production for the plants to have as long a growing season as possible before bulbing begins, hence the very large bulbs produced by autumn sowing or by spring sowing under glass. American varieties grown in England have a relatively short photoperiod for bulbing and hence start to bulb early and ripen off in the long days and high temperatures of June. The data suggest that seedlings may need a longer photoperiod for bulbing than plants from sets and a day length just adequate for bulbing at high temperature may be insufficient at low temperature. High temperature storage tends to produce distorted leaves and to delay and restrict bulbing and ripening. It is hoped that, though the analysis presented is empirical, the main conclusion reached in the complex problems involved may be of wide practical application.

738. Tincker, M. A. H., and Brown, F. C. 635.25
Onion production from sets.
J. roy. hort. Soc., 1944, **69**: 66-8.
The article summarizes the results of experimental work on the production of onion sets in England, carried out at Wisley and other places. Detailed research accounts will be published elsewhere. The present paper gives full instructions on the growing of onion sets dealing with such subjects as set production, set storage and grading, set size, manuring, spacing and cultivation, harvesting and drying, varieties, keeping qualities.

739. Davis, G. N. 635.25
Onion production in California.
Circ. Calif. agric. Exp. Stat. **357**, 1943, pp. 1-19.
Instructions for growing the onion crop in California are given. Areas of production, cultural requirements, fertilizers, cultural methods, harvesting and curing, storage,

grading, production of dry onion sets and green bunching onions and seed production are discussed. The principal varieties grown in California are listed and described. The common fungus and insect pests and recommended control measures for each are given. G.N.D.

740. PLINKA, A. D. 635.25
The autumn planting of onions. [Russian.]
Vestnik Ovoščevodstvo i Kartofelj, 1941, No. 1, pp. 103-4.

In the central and northern parts of the U.S.S.R. the onion is usually propagated by sets. Plants predisposed to bolting occur more frequently in some varieties than in others, and, within each variety, more are produced by the larger sets than by the smaller. An experiment carried out at the Gribovskaja plant breeding station, Moscow province, showed that onion sets may be successfully planted in autumn if the facts indicated above are taken into consideration and during vernalization the large sets are subjected to a higher temperature than the smaller sets. It was also shown that sets should be chosen from those varieties least inclined to produce compound bulbs rather than a single well-shaped bulb. In this connexion, sets of medium size gave rise to a better type of bulb than did the largest or smallest.

741. KRICKL, M. 635.25: 631.521: 664.84.25
Spätaustreiben—relativ geringer Gewichtsverlust —hoher osmotischer Wert. Ein Beitrag zur Züchtung besonders lagerfester Speisezwiebeln. **(Late sprouting—relatively small loss of weight—high osmotic value. The breeding of long-keeping onions.)**
Gartenbauwiss., 1942, **17**: 51-90, bibl. 9.

The prolongation of the storage life of onions was the object of extensive investigations conducted at the Agricultural Experiment Station, Vienna. The selection of suitable bulbs for breeding by such characters as relatively smaller loss of weight during storage and high osmotic value is described in detail. The structure of the bulb is also taken into account.

742. RHODESIA GOVERNMENT HORTICULTURIST. 635.25
The growing of onions and correct harvesting and marketing methods.
Rhod. agric. J., 1944, **41**: 14-6.

The only onion recommended for commercial planting in Southern Rhodesia is the Early Cape Flat, often called Cape Flat Yellow, deriving from imported Yellow Bermuda. Globe varieties of onion do not bulb satisfactorily. The seedlings are transplanted to the field when 6 inches high and of pencil thickness. Most of the root system and half the green top is cut off. Watering at planting and frequent irrigation till the bulbs are well formed is necessary. The secret of profitable culture is to harvest the crop while the tops are still green. The tops will exhaust all the surplus moisture from the bulb in about 10 days. The lifted bulbs are not unduly exposed to strong sunlight but are placed in layered rows one above and behind the other, the tops of the layer above covering the bulbs of the layer beneath. The bulbs of the final row are covered with a little grass. The bulb is ready for lifting when the neck feels soft and pliable when squeezed just above the bulb. Although not classed as a keeper in U.S.A. this variety, treated as described, will store from November to June. Rhodesian onions have a bad name simply because of faulty lifting, i.e. allowing the bulbs to ripen and dry off in the field or lifting with green tops, cutting these off at once and bagging for marketing.

743. ERENBURG, P. M. 635.25
A brief account of work on the Dungan onion.
Bjull. Kazah. Naučno-issled. Inst. Zemled. im. Akad. V.R. Viljjamas, 1940, No. 7-8, pp. 11-9.

An account of an onion variety which is said to possess considerable advantages over others now cultivated in the Alma-Ata region by reason of its non-bolting, spring frost resistance, good yielding and good keeping qualities. Grown in rows 45-50 cm. apart it will give 15 to 25 tons of bulbs per hectare.

744. (BLACKMAN, G. E.) 632.954: 635.1/7
Sulphuric acid for the control of weeds.
Gdnrs' Chron., 1944, **115**: 110.
,, **Acid spraying of weeds.**
Fruitgrower, 1944, **97**: 183.

The difference in the wording of the title is the sole difference in these two summaries of Mr. Blackman's address on weed control at Guildford on 8 February. Clean seedbeds of onions, carrots, leeks, parsnips and beetroot could be obtained by sulphuric acid spraying after sowing but before the crop emerges. The exact strength of the acid for particular weeds is not mentioned, the information being available in Advisory Leaflet No. 309 [see Abstract 745 below]. Onion and leek foliage does not hold the spray, hence the onions may be sprayed while in the loop stage and again, if need be, at the end of May. Leeks may be sprayed in the seedbed, and again one month after planting out, but not later than August. The slight depression in yield brought about by acid spray is more than compensated by the saving of labour for hand weeding and so allows of a much greater acreage being grown. Hoeing after spraying merely results in a fresh germination of weed seeds and may nullify the effects of the spraying. The acid penetrates to a depth of ½ in. below the surface, combining with the lime to form gypsum and using up to the equivalent of 1½ cwt. of chalk per acre, an amount easily replaced in routine liming. Soil organisms are not affected. Substitutes for sulphuric acid, such as copper chloride, copper sulphate, tar-oil and dinitro-orthocresol, are slower and less effective. A note is given of suitable spraying machines.

745. MINISTRY OF AGRICULTURE. 635.25: 632.954
Weed control in onions and other horticultural crops by sulphuric acid sprays.
Advis. Leafl. Minist. Agric. Lond. **309**, 1943, pp. 4.

Read in conjunction with the previous abstract a note of the concentrations used in sulphuric acid spray for weed destruction may be timely. Pre-emergence spray; B.O.V. (brown oil of vitriol) 13 gal.; wetting agent 1 pint, water 100 gal. Sulphonated oil is a suitable wetter, soft soap is not. Spraying the growing crop: B.O.V. 10 gal., wetter 1 pint, water 100 gal. Certain soft weeds such as yellow charlock, cress, etc., can be destroyed with a 7% solution. Only partial control can be obtained over fumitory, sow thistle and mayweed. Weeds are most certainly killed if sprayed just as the first true leaves are expanding between the cotyledons. From 120 to 150 gal. per acre will be needed with knapsack and 100 gal. per acre with power sprayers. If not acquainted with the method of mixing sulphuric acid, intending users should read the Leaflet.

746. BERRY, L. J., AND HOYT, R. C. 635.25: 631.588.1
Stimulation of the onion root by alternating current.
Plant Physiol., 1943, **18**: 570-87, bibl. 6.
BERRY, L. J., AND HOYT, R. C. 635.25: 631.588.1
Polarization and stimulation of the onion root by direct current.
Plant Physiol., 1943, **18**: 372-96, bibl. 19.

747. HALL, J. W. 635.263
Shallots.
Gdnrs' Chron., 1944, **115**: 52.

A small experiment at the Edinburgh College of Agriculture demonstration plot, when statistically analysed, indicated that there was no difference in yield between shallots planted in November and March, and that the large shallots over 1¾ in. in length gave a higher yield by weight than those

between 1 in. and 1½ in. The belief that small shallots yield a large crop of big ones and that large shallots give rise to an increased number of small ones was not upheld by these results.

748. HASSEBRAUK, K. 635.31: 632.452
Zur Frage der Verwendung kupferhaltiger Spritzmittel im Kampf gegen den Spargelrost. **(The control of asparagus rust (*Puccinia asparagi*) by means of copper-containing sprays.)**
Phytopath. Z., 1942, **14**: 76-82, bibl. 10.
Discussing recent papers on the control of asparagus rust the author notes that they confirm his previous results (*Gartenbauwiss.*, 1938, 12: 1-16; *H.A.*, 9: 138), namely that copper-containing sprays cannot be recommended for use on older beds, though for young beds they are beneficial.

749. CHRISTIANSEN, E. 635.31: 631.523
Breeding trials with asparagus varieties 1933-40. [Danish.]
Tidsskr. Planteavl., 1942, **46**: 704-18, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 158.

750. MAPPES, F. 635.34
Zur Frage der Rentabilität der Pflanzenanzuchtmethoden im Frühkohlanbau. **(The best methods of raising early cabbage plants.)**
Obst-u. Gemüseb., 1941, **87**: 134-6, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 50.
In order to determine the most profitable method of raising plants of early cabbage varieties the following treatments were compared: (1) pricking out once, (2) raising in clay pots, (3) in cardboard pots, (4) in pressed soil pots. It was found that treatment (2) gave the best results followed by (4) and (3). Raising the plants in pots of any of the materials tested was superior to pricking out.

751. ANON. 635.34 + 664.84.34.047
Cabbage for dehydration.
Agriculture, 1944, **50**: 565-7.
Variety trials with cabbage for dehydration, carried out in 5 counties, have not yet led to conclusive results and are being continued. The dry matter content and the concentration of ascorbic acid was found to be higher in smaller cabbages from Surrey than in large cabbages grown in Cambridgeshire with better water supply, whilst the sugar content was constant. There was more vitamin C in the green spring types than in the summer cabbage or savoy, but the trimming losses in the former group were high. Golden Acre, a " Primo " type, and Best of All are so far the most promising varieties of summer cabbage and early savoy respectively.

752. KRICKL, M. 635.34
Möglichkeiten im Adventgemüsebau. Züchtung der Sommersorten von Kopfkohl auf Wintersorten. **(Possibilities in the growing of winter vegetables. The breeding of winter varieties from summer varieties of headed cabbage.)**
Züchter, 1941, **14**: 185-96, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 95.
The author suggests that the expensive method of producing early cabbages by raising the plants in frames could be replaced by late summer and autumn sowings and transplanting on the field. If the weather in March was favourable plants grown in this way were a fortnight earlier than forced plants of early cabbage varieties. In the first year the losses from cold were 50% and the percentage of bolted plants was high. By means of selection, however, the plants were sufficiently hardy in the 4th generation, when also no more bolting occurred. It is thought that onions, peas and kohlrabi could be treated in the same way. Side shoots from cabbage plants raised for seed were propagated as cuttings during the summer. Thus small clones were raised which guaranteed a higher yield of seed per mother plant.

753. MASLENNIKOV, I. P. 635.34: 632.76
The cabbage stem weevil and how to combat it. [Russian.]
Vestnik Ovoščevodstvo i Kartofelj, 1941, No. 1, pp. 105-10.
The cabbage weevil described in this article belongs to the genus *Ceutorrhyncus*, of the family *Curculionidae*. It first attracted notice in Russia during 1916, and since that time has done damage to many kinds of cruciferous plants in northern, central and southern parts of the country. Young and old plants alike are open to attack both by the beetle and, with more damaging results, by the larvae, which eat out the leaves, particularly at the midribs, and then work their way to the stem. Fortunately the larvae are, in their turn, liable to destruction, sometimes to the extent of 20-30%, by the larvae of *Thersiolochus nigricans*, also by ants, and a fungus not yet identified. In addition to destroying cruciferous weeds and all plant material infested by the insect, as well as introducing a suitable rotation of crops, chemical dusts and sprays are recommended as a means of control.

754. HAMERSMA, P. J., STOFBERG, F. J., AND NAUDE, C. P. 635.34: 632.951
The fluorine and arsenic content of cabbage after dusting with insecticides: cryolite, arsenate of lead and calcium arsenate.
Sci. Bull. S. Afr. Dep. Agric. **13**, 1942, pp. 21, bibl. 37, being *Ent. Ser.* No. **10**.
Thirty-six dusting treatments, tested at Nelspruit Research Station, South Africa, showed that up to 3 applications, not too soon before harvesting, of cryolite, of lead arsenate and of calcium arsenate at the rate of 50-60 lb. per half morgen [1 m. = 2⅛ acres] are safe for the consumer.

755. BARR, C. G., AND NEWCOMER, E. H. 635.34: 547.944.6
Physiological aspects of tetraploidy in cabbage.
J. agric. Res., 1943, **67**: 329-36, bibl. 18.

CHANDLER, F. B. 546.27: 635.35 + 633.491
Nutrition of brassica and potatoes.
Soil Sci., 1944, **57**: 67-73, bibl. 19.

756. BRANDENBURG, E. 546.27: 635.35 + 635.348
Über Bormangel an Blumenkohl und Kohlrabi. **(Boron deficiency in cauliflower and kohlrabi.)**
Angew. Bot., 1942, **24**: 99-113, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 36-7.
The symptoms of boron deficiency in cauliflower and kohlrabi are described. It is thought that with cauliflower, which requires comparatively large amounts of boron, such deficiency symptoms will occur not infrequently in the field. The experiments were carried out at Bonn and Vienna.

757. JONES, W. 635.35: 632.4
Downy mildew disease of cauliflower seed plants.
Sci. Agric., 1944, **24**: 282-4, bibl. 3.
Peronospora brassicae, a common parasite of cruciferous plants, has recently become unusually injurious to the curds of cauliflower being grown for seed in British Columbia. The disease was studied at Saanichton Experimental Station. The disease as produced by inoculation had discoloured the surface of the curd within 3 weeks and in 6 weeks the curd had become shrivelled, stunted and brown. In the field insects such as flea beetles, thrips and aphids cause lesions on the curd through which infection can enter. The control suggested is to spray the seedlings in the seedbed as soon as the first leaves develop with bordeaux mixture + a spreader and sticker such as calcium caseinate. Plants attacked in the field may be dusted with copper lime every 10 days till the floral parts are well developed. Insect pests should also be kept down.

758. PRESTON, N. C. 632.42: 635.36
Club root disease.
Gdnrs' Chron., 1944, **115**: 128.
In a small-scale experiment at the Harper Adams Agricultural College club root of brussels sprouts, grown on a heavily infected plot, was successfully controlled by dipping the seedling roots in a " puddle " of 1½ lb. calomel thoroughly mixed with 11 oz. of water just before transplanting. Although 43% of the treated plants were found to be severely clubbed—as against 80% of the untreated plants—there was a sixfold increase in the yield as compared with the check. This result suggests that the treatment protects the plants until they are well established. The same mixture proved effective for the control of the cabbage root fly. In this case the paste may be slightly thinner, and it should be applied also to the stems.

759. NOACK, K., AND TIMM, E. 635.41: 581.192
Vergleichende Untersuchung der Proteine in den Chloroplasten und im Cytoplasma des Spinatblatts. (A **comparative investigation of the proteins in the chloroplasts and in the cytoplasm of the spinach leaf.**)
Naturwiss., 1942, p. 453, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 145.
TIMM, E. 635.41: 581.192
Vergleichende Untersuchung der Proteine in den Chloroplasten und im Cytoplasma des Spinatblatts. (A **comparative investigation of the proteins in the chloroplasts and in the cytoplasm of the spinach leaf.**)
Z. Bot., 1942, **38**: 1-25, from abstract *Gartenbauwiss.*, 1943, Vol. **17**: abstr. p. 144.

760. MUKERJI, B. 635.48
Indian rhubarb as substitute for " official " rhubarb.
Curr. Sci., 1943, **12**: 175, bibl. 1.
It is suggested that the cultivated varieties of *Rheum emodi* growing in the Himalayas at altitudes of 4,000-12,000 feet are a full substitute for Chinese rhubarb. Comparative analytical and pharmaceutical data are given.

761. MORGAN, C. N. 635.52
Lettuce-growing.
Qd agric. J., 1943, **57**: 282-90.
A detailed description of large-scale lettuce growing in Queensland.

762. RALEIGH, G. J. 635.52: 631.531
The germination of dormant lettuce seed.
Science, 1943, **98**: 538, bibl. 1.
Dormancy of freshly gathered lettuce seed is often responsible for delay and loss in improvement work. In the investigations reported freshly gathered seeds of *Lactuca sativa* and *L. serriola* were treated by soaking for 72 hours in 2 ml. of 0·5 thiourea in water following the method of Thompson and Kosar (*H.A.*, 1940, 10: 154) except that the seed germination on filter paper in 95 mm. Petri dishes at 21°-28° C. was done in diffused light of 150 foot candles instead of in darkness. After 72 hours 98% of the seeds in light had germinated compared with less than 1% of those in the dark. The markedly retarding effect of thiourea on seedling growth can be eliminated without loss of stimulation of germination if the seed is treated with thiourea for 24 hours and then washed. Treatment is started in late afternoon so that the seeds may have the maximum period of light following the night period when absorption of the thiourea solution may take place.

763. KOLEFF, N. 635.52: 631.531
Untersuchungen über die Keimruhe bei Salatsamen (*L. sativa* var. *capitata* L.). I. Mitteilung. **(Experiments on the rest period of lettuce seed. Preliminary report.)**
Gartenbauwiss., 1943, **17**: 263-72, bibl. 19.
The germinating power of lettuce seed in the light and in the dark was studied. Not one of the varieties tested showed any rest period at a temperature of 20-22° C. in the dark. At temperatures above 25° C. the germination of different varieties varies greatly. Light was not observed to hasten germination; on the contrary, it checked the process in some varieties. Under conditions of continuous light irregularities in the germination process were found to occur. The author believes that by means of selection varieties would be produced requiring no rest period for their seeds even at high temperatures. It is suggested that a relation exists between the reaction of the seed to light and the photoperiodical reaction of the variety.

764. MOINAT, A. D. 635.52: 546.27: 577.15.04
Nutritional relationships of boron and indoleacetic acid in head lettuce.
Plant Physiol., 1943, **18**: 517-23, bibl. 7.
A concentration of 0·005 p.p.m. of boron in the nutrient solution gave excellent growth of lettuce and prevented, while 0·001 p.p.m. delayed, the appearance of deficiency symptoms. Indoleacetic acid sprayed on the plants, when used at the higher concentrations (maximum 300 p.p.m.) during the last period of growth, caused definite structural peculiarities and did not prevent the appearance of boron deficiency symptoms. Neither boron nor indoleacetic acid prevented tipburn. Both a deficiency of boron and a high boron concentration in the nutrient solution resulted in a lower moisture content in the plant shoot.

765. DOUGLASS, J. 635.61/62: 631.531
The harvesting and threshing of cucurbit seed.
Agric. Gaz. N.S.W., 1943, **54**: 499-500, 516.
It is emphasized that growing cucurbits for seed is a distinct operation from growing them for market. The best methods of harvesting and threshing cucurbit seeds in New South Wales and the latest machinery are described.

766. JANSEN, J. A. 635.61
Cultivation of melons in Iceland.
Gdnrs' Chron., 1944, **115**: 67.
An account of glasshouse cultivation of melons in Iceland. The raised beds are prepared 5-7 days before planting by filling trenches 2 ft. wide and 10 in. deep with horse manure and straw and covering with 8 in. of soil to which has been added 7 lb. superphosphate and 4 lb. sulphate of potash per 100 ft. of trench. The seedlings from seed sown in February are planted out the first week in April and supported on strings. The side growths are stopped above the first leaf beyond the female flower, or above the first leaf if bearing no female flower. Artificial fertilization may be necessary. The plants are topped at 4 ft. and after 2 or 3 fruits have set all superfluous growths are thinned out. When the fruits are egg size a further dressing of 2 lb. sulphate of potash and 2 lb. sulphate of ammonia per 100 ft. of trench is applied. No mention is made of temperature beyond the statement that in Iceland some artificial heat is necessary. The fruits, which should weigh 4½ lb. each, are supported by netting. The crop is very profitable and can be cleared by mid-July. A diagram shows the method of planting. A tomato crop can follow, provided strong plants are available.

767. MANN, L. K. 635.61: 581.162.3
Fruit shape of watermelon as affected by placement of pollen on stigma.
Bot. Gaz., 1943, **105**: 257-62, bibl. 5.
Large inequalities of pollen among stigmas will cause differential growth among the 3 carpels, the fruit developing radial asymmetry, especially at the blossom end. The reasons for this are explained.

768. MOISSEJEWA, M. 635.61/62: 631.541.11: 612.014.44
Der Einfluss von Licht und Luftzufuhr auf das Zusammenwachsen des Pfropfreises und der Unterlage bei Transplantation von Cucurbitaceen. **(The influence of light and air supply on the union of scion and rootstock in *Cucurbitaceae*.)**
Ber. dtsch. bot. Ges., 1942, **60**: 323-35, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 111.

Only very small losses occurred when the grafting of melons on pumpkins in the seedling stage was carried out in full daylight, but in shade, at temperatures of 23-27° C. The union, which requires light and particularly oxygen, must not be bound tightly. The question is discussed whether an improved technique, with special regard to light and air supply, might not achieve better results in so-called incompatible grafts.

769. STRAUGHAN, W. R. 635.62
Pumpkins, squashes and marrows, and grammas.
Qd agric. J., 1943, **57**: 325-33.

Although pumpkins, squashes, marrows and grammas were not appreciated by consumers in Queensland until recently, a total of 20,000-25,000 acres is now devoted to these crops every year. Their cultivation, harvesting and storage is described in detail and the characteristics of a number of varieties are noted.

770. SOKOLOVA, A. M. 635.64: 576.356.5
Tetraploid tomatoes. [Russian.]
Vestnik Ovoščevodstvo i Kartofelj, 1941, No. 2, pp. 39-47.

Tomato tetraploids obtained by the decapitation method were below the respective diploids in yield, especially in cool seasons, when they sometimes failed to give a crop at all. An exception was provided by *L. pimpinellifolium*, whose tetraploid yielded nearly three times as much fruit as the diploid. The number of seeds per fruit never exceeded 60 in the tetraploids, whereas the diploids had up to 180. The tetraploids were later in flower and fruit ripening and the fruits were less abundant. The tetraploid fruits, however, kept much better in storage and were still sound in the middle of December; some kept even into January. This is ascribed to their higher dry matter content, and coarser skins, which crack less than those of the diploids. The tetraploids also had a higher sugar content; the vitamin C content was greater in some and less in others. Attempts to cross the tetraploid forms of Humbert and First Crop with their respective diploids mostly failed, only three fruits being obtained from several hundred crosses, and these proved to be parthenocarpic, being devoid of seeds.

771. FRIMMEL, F. v., AND LAUCHE, K. 635.64: 631.523
Neue Wege der Züchtung auf Frühreife bei Tomaten. **(New methods of breeding for earliness in tomatoes.)**
Z. Pflanzenz., 1941, **24**: 374-82, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 58.

An early tomato should have the greatest possible number of fruits matured at the earliest possible date. Certain varieties were observed to show great variability in this respect. Schlösser found earliness to be related to the height at which the first truss is inserted. The in-crossing of varieties with divided inflorescences is recommended.

772. KOLEFF, N. 635.64: 631.523
Neues Zuchtziel bei der Tomatenzüchtung. **(A new aim in tomato breeding.)**
Züchter, 1942, **14**: 264-6, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 129-30.

From the American variety Pritchard's Scarlet Copper a strain was selected which forms inflorescences after every second leaf, whilst the majority of varieties form inflorescences after every third or even fourth or fifth leaf. The significance of this character is connected with a previous discovery that earliness is related to low insertion of the fruit truss. It is hoped that some shortcomings of the new strain will be remedied by combination crosses.

773. (BEWLEY, W. F.) 635.64
Cultivation of tomatoes.
Gdnrs' Chron., 1944, **115**: 108.

A summary of a series of recent talks to North Country growers by the director of Cheshunt Experimental Station, in which are discussed the major points of successful glasshouse tomato production. Contamination from certain water supplies such as ponds, streams, etc., and surface wells can often ruin a crop. After cropping, the houses should be cleared of debris and disinfected with formaldehyde, cresylic acid or by sulphur fumigation. The debris of an outdoor tomato crop left too near the glasshouse can prove a source of stem canker infection. Various methods of sterilizing soil, pots and boxes were described but are not given in detail. Any sickly plant should be eliminated in the propagation house. Winter flooding of the greenhouse soil is important. To wet the subsoil effectively from 1 to 3 floodings at the rate of 80,000 gal. per acre are necessary, the number depending on the soil drainage. Failure to set the bottom truss was common in too robust plants having an incorrect C/N ratio. Ways of checking this are suggested. Weak stems and poor trusses which failed to set might result from failure to feed the plant early enough and so counteract the demands of the bottom truss. The first top dressing should be given when the 3rd truss has set. Thin top growth was a symptom of an unhealthy root system. Very successful crops could be grown in low cucumber houses. In this case a tomato of the Potentate group was ideal, for the lateral fruiting habit was the basis of roof growing.

774. ANON. 635.64
Growing tomatoes out of doors. (Experimental results.)
Leafl. John Innes hort. Inst. **5**, 1944, pp. 6.

In this 3rd edition of the leaflet the results of variety trials with outdoor tomatoes carried out 1941-3 are summarized. The data presented refer to average yield of ripe fruits to 10 September, average total yield of ripe fruits and average total yield, including green fruits.

775. AMLONG, H. U. 577.15.04: 581.11
Über den Einfluss der Hormonisierung auf die Transpiration der Pflanze. **(The influence of hormone treatment on the transpiration of plants.)**
Naturwiss., 1943, pp. 44-5, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 143.

Tomato seeds were treated in a solution of 100 mg. potassium naphthylene acetate, 100 mg. ascorbic acid and 2,000 mg. thiourea per litre for 24 hours, then rinsed, dried for 12 hours and sown. Pots of treated plants before watering were generally found to be lighter than the controls, which is taken as an indication of increased transpiration, possibly owing to a better developed root system. Also cut leaves of treated plants showed a higher transpiration rate than the checks. In some respects treated plants are said to resemble xerophytes. Thus hormone treatment will increase both yield and drought resistance.

776. BEWLEY, W. F. 631.87: 631.544
The use of straw in glasshouse soils.
Ann. appl. Biol., 1943, **30**: 399-400.

Tomato soils in greenhouses showing reduced yields through continuous cropping can be brought back into condition by the incorporation of wheat or oat straw. The best results are obtained by placing the straw in the soil with the haulms vertical, which can easily be done by bastard trenching. The straw walls should be 2 in. apart and extend to a depth of

20 in., and 1-2 in. of straw should stand up above the surface of the soil. This is done a month before planting and does not obviate the need for the usual fertilizer dressing. A more rapid method termed "spade insertion" can be used just before planting. A line is stretched parallel to the double rows and about 6 in. away from the plant positions on the outside of each row. A V-shaped cut, 14 in. deep, is made with a spade along the line. Straw cut in 20 in. lengths is laid along the cut, 10 in. projecting on either side. The spade is held above the straw at a point immediately above the slit and pressed downwards, forcing the straw into the ground, leaving, when completed, walls of straw outside each double row. The amount of straw needed is 6 tons/acre per spit of depth. Recently there have been marketed bands of straw 2 in. thick and of any desired width from 10 to 20 in. The bands are woven together with string, the straws being laid parallel. These bands are specially made for insertion in the soil and their use simplifies the work considerably. Straw walls have also proved useful in watering dry subsoils without flooding the surface. Soil improvement also follows the forking in of a chopped straw layer ½ in. thick (6 tons/acre). In soils low in nitrogen the layer should be damped and sprinkled with 2-5 cwt. sulphate ammonia/acre

777. WESTERN, J. H., AND STEWART, R. 635.64: 631.462
The effect of a chemical soil sterilizing agent on the subsequent development of tomato plants.
Ann. appl. Biol., 1943, **30**: 370-2, bibl. 1.

Orthodichlorbenzene in a proprietary, chemical, soil-sterilizing agent caused injury to greenhouse tomato plants, rendering the leaves coarse and leathery, distorting the leaflets and inhibiting fruiting. The source of the trouble, which originated in several commercial nurseries, was determined at Manchester University.

778. MULLARD, S. R. 635.64: 631.589: 663.61
Soil-less cultivation by the sub-irrigation system.
Carnation Yearb., 1943, pp. 32-4. Brit. Carnation Soc., 23 Russell Chambers, Covent Garden, London, W.C.2. 3s. 6d.

Notes are given on some results obtained in 1942 at the Bakeham Farm Nurseries with the sub-irrigation system of soil-less cultivation which has been in use for the past 5 years. The area of the tank is 24 ft.; the substrate was gravel and each tomato plant, variety E.S.1, occupied 1 sq. ft. The yield averaged 8 lb. of ripe fruit per plant. The following nutrient concentration was maintained after the 3rd truss had formed: nitrogen 200-100 p.p.m., phosphorus 25-15 p.p.m., potash 170-80 p.p.m., magnesium 40-25 p.p.m. The solution was completely replaced on 3 occasions during the growing period of 7 months. The cleaning of the supply tank was followed by marked improvement in the progress of the plants.

779. HAYWARD, H. E., AND LONG, E. M. 635.64: 632.19
Some effects of sodium salts on the growth of the tomato.
Plant Physiol., 1943, **18**: 556-69, bibl. 12.

An experiment was set up at the U.S. Regional Salinity Laboratory, Riverside, to determine the response of tomato plants to sodium chloride and sodium sulphate supplied together in different proportions and at several levels of total concentration. The osmotic concentration of the substrate appeared to be a primary factor in growth inhibition although secondary effects of the $Cl-$ and $SO_4=$ are noted. High concentrations of the substrate reduced height, diameter and fresh and dry weight of stems, decreased cambial activity, inhibited floral development and reduced set, size and weight of fruit. The osmotic concentration of the vegetative and fruit juices was increased. There was a greater accumulation of Cl, SO_4 and Na with increasing increments of salt in the substrate. Flavour remained unimpaired. Incidence of blossom-end rot appeared to be related to wide fluctuations in water stress, with the high accumulation of potassium as a possible contributing factor.

780. VALLANCE, L. G. 635.64: 631.843
Blood and bone for tomatoes.
Qd agric. J., 1943, **57**: 347-8.

Blood and bone was shown to supply the nitrogen and phosphate requirements of tomatoes in fertilizer trials in the Cleveland area, Queensland. One kerosene tinful (approx. 35 lb.) is the amount tentatively suggested to be applied as a basic dressing for a five-chain row. Thorough mixing with the soil is necessary before planting and the following operations after application of the fertilizer are recommended: two scufflings in the first fortnight followed by re-ploughing the drill and another scuffling. Every opportunity of working and aerating the soil should be taken and it should be ascertained that no lumps of rotting fertilizer are present towards the bottom of the drill.

781. PAPE, H. 635.64: 632.19
Eine bisher nicht beschriebene Missbildung der Tomatenpflanze. **(A malformation of tomatoes previously not described.)**
Z. PflKrankh., 1942, **52**: 389-92, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 58.

At Kiel, Germany, a tomato plant of the variety Lucullus produced trusses which were extremely ramified and formed coral-like, fleshy protuberances of a whitish colour instead of flowers at the tips of the hundreds of tiny branches.

782. BAILEY, L. F., AND MCHARGUE, J. S. 635.64: 632.19: 546.56
Copper deficiency in tomatoes.*
Amer. J. Bot., 1943, **30**: 558-63, bibl. 27.

Tomatoes were grown at Kentucky University Experiment Station in purified culture solutions containing no copper and concentrations of 0·01, 0·05 and 0·10 p.p.m. Cu respectively. Copper deficiency symptoms occurred only in plants receiving no copper and were characterized by retarded or completely inhibited flowering, no seed formation, an upward and inward rolling and severe necrosis of the leaves, which also developed a bluish-green colour. The growing tips were unaffected except for a tendency to wilt easily. Presumably unintentional copper contamination was here a factor. The optimum copper concentration for top growth was 0·05 p.p.m., for fruits 0·01 p.p.m. Plants showing severe copper starvation contained relatively large amounts of copper on the basis of unit dry weight, slightly higher in fact than that in the treated plants; in the latter accumulation did not vary whatever the amount of copper added to the nutrient solution. From these and other data it is suggested that copper taken into the plant is soon converted into an unavailable form which is not mobile and constitutes a phenomenon which must be considered in any analysis of the function of copper in the plant.

783. SELMAN, I. W. 635.64: 632.8
The appearance and spread of mosaic infection in the tomato crop and the relation to seed transmission of the virus.
Ann. appl. Biol., 1943, **30**: 331-8, bibl. 16.

From investigations at Cheshunt Research Station it appears that delayed seed transmission of mosaic-inducing viruses can occur in the tomato crop and may be interpreted by postulating differences in the resistance of plants raised from seeds of differing origin to the multiplication and systemic spread of those viruses, though whether the latter originate from internal or external sources is not clear. In certain circumstances associated with malnutrition or with insufficiently ripened seed, viruses may be present in the embryo

* For boron and tomatoes see 447.

and may persist in extracts of the germinating seed. Resistance of plants to systemic infection by relatively small numbers of virus particles such as would occur in infected seed is much influenced by soil conditions, especially of texture, moisture and nutrient balance. In favourable environments such as, however, are seldom found in commercial glasshouses, plants raised from virus-free seed are unlikely to show advantage over other plants in respect to the incidence of mosaic infections. On commercial nurseries the use of virus-free seed from vigorous plants must be regarded as essential to the production of a virus-free crop.

784. WELLMAN, F. L. 635.64: 632.8
Comparative toxic effects of extracts from mild and virulent isolates of tomato-wilt fusarium.
Phytopathology, 1943, **33**: 1004-17, bibl. 19.
Results obtained in comparative assays of a virulent and a mild strain of *Fusarium* showed that the former strain produced the more toxic material in liquids and that the filtrates were highly toxic after a much shorter period of incubation than was required by the mild strain. Effective resistance to the advance of the pathogen in the tissues of tolerant or resistant host types may be the result of restraining the growth of the organism within the host rather than of a neutralization of a toxin.

785. WARE, W. M., AND GLASSCOCK, H. H. 635.64: 632.3
Bacterial canker of tomatoes.
Agriculture, 1944, **50**: 499-503.
A disease of tomatoes, hitherto unknown in Britain, was identified at Cambridge as bacterial canker caused by *Corynebacterium michiganense* and studied at Wye. The disease, which is widespread in America, occurred in a Sussex greenhouse in 1942 and in some outdoor plantations in West and East Sussex and Surrey in 1943. In two instances 20 and 25% respectively of the plants were damaged. Typical diseased specimens were about 20 in. high with fruits about the size of peas. The stems had dark brown lesions beginning at a point 4½ in. above the collar and extending for 12 in. In cases of slight infection the cutting of a lower leaf at its base will expose a ring of discoloured tissue which provides an easy method of diagnosis. Control measures are confined to prevention, mainly by avoiding seed from areas where the disease has occurred and to taking the necessary precautions in foreign seed trials. Growers are asked to report the incidence of the disease.

786. BORODAVČENKO, M. V. 635.64: 632.3
Bacterial canker of tomatoes. [Russian.]
Bjull. Kazah. Naučno-issled Inst. Zemled. im. Akad. V.R. Viljjamas, 1940, No. 1-2, pp. 17-20.
It was found at the Kazah Agricultural Institute that out of a number of tomato varieties, Budenovka and Baltimore were the least affected by bacterial canker (*Aplanobacter michiganense*). Prophylactic methods of preventing or controlling the disease are described.

787. MOORE, W. D., AND THOMAS, H. R. 635.64: 632.48
Some cultural practices that influence the development of *Alternaria solani* on tomato seedlings.
Phytopathology, 1943, **33**: 1176-84, bibl. 7.
Investigations conducted in Georgia and Indiana, 1937-42, showed that 3 factors in the production of tomato seedlings in the field for transport to the north govern the development of *Alternaria solani*. Susceptibility of the plants was found to increase with increasing age, wilting periods and length of time stored in transit. Cultural control measures suggested are: not too early planting, use of young plants, careful packing, and transplanting with a minimum of delay.

788. ROBERTS, F. M. 635.64: 632.48
Factors influencing infection of the tomato by *Verticillium albo-atrum*.
Ann. appl. Biol., 1943, **30**: 327-31, bibl. 14.
This study, which forms part of a general investigation on *Verticillium* wilt, was carried out at Rothamsted Experimental Station. Infection was encouraged by the application of nitrogenous manures, by a deficiency of potash and by the inoculation of *Verticillium* into steam sterilized soil immediately after steaming but not when soil inoculation took place 17 days after steaming. Phosphate application had no effect on the progress of the disease. The killing of an infected plant hastened the spread of the disease from its roots to those of neighbouring healthy plants.

789. BEWLEY, W. F. 635.64: 632.4
Tomato canker disease.
Mkt Gr., 1943, **21**: 51: 1-2.
Didymella fungus disease of tomatoes forms greyish-brown disc-shaped lesions, darker than those of *Botrytis*, and having pink spores. The attack is generally at ground level, though there can be root infection. Secondary infection can be caused, as by trimming operations, on the leaves, and in outdoor tomatoes the fruit may be infected without any symptoms appearing on leaf or stem. The disease has not been found in the embryo but might well appear on the seed coat. Seed should not be saved from outdoor-grown tomatoes. With indoor plants infection is highest after the beginning of June. Seedlings or small plants in pots are not attacked. None of the ordinary sprays will control the disease but some success has been had with Shirlan A, 1 in 50, plus twice the normal amount of spreader. This is best used on the stems when the bottom leaves have been removed. Although apparent success has been achieved by painting the lesions with creosote on outdoor tomatoes at Worthing, it is possible for the disease to continue to grow under the skin.

790. WATKINS, T. C., AND LOGAN, S. H. 635.64: 632.76
Reduction of flea beetle injury to tomato transplants by treatment prior to setting.
J. econ. Ent., 1943, **36**: 584-6, bibl. 2.
Dusting or spraying tomato plants before planting out with any one of a number of standard insecticides appreciably reduced punctures of the potato flea beetle (*Epitrix cucumeris*) at Cornell University. There was, however, no improvement in yield over the untreated controls, nor did the yield reflect the relative efficiencies of the materials used.

791. WILCOX, J. 635.64: 632.951
Rate of application and strength of cryolite dust mixtures in tomato fruit worm control.
J. econ. Ent., 1943, **36**: 700-5, bibl. 2.
Three applications of 70% cryolite dust given at 2-week intervals are not quite so effective against *Heliothis armigera* but are more economical than 6 applications at weekly intervals. Whether treatment is economic depends on the amount of damage which experience shows to be likely.

792. BAILEY, S. F., AND KEIFER, H. H. 635.64: 631.654.2
The tomato russet mite, *Phyllocoptes destructor* Keifer: its present status [in California].
J. econ. Ent., 1943, **36**: 706-12, bibl. 11.
Sulphur would appear to be an essential ingredient of any control material.

793. ROBBINS, W. J., AND KAVANAGH, V. 635.64: 581.144.2
Growth of excised roots of polyploid tomatoes.
Amer. J. Bot., 1943, **30**: 602-5, bibl. 4.

MELCHERS, G. 635.64: 632.8
Über einige Mutationen des Tabakmosaikvirus und eine "Parallelmutation" des Tomatenmosaikvirus. **(Some mutations of the tobacco mosaic virus and a "parallel mutation" of tomato mosaic virus.)**
Naturwiss., 1942, p. 48, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 13.

794. RANNINGER, R. 635.65: 631.535
Die vegetative Vermehrung der Buschbohne. **(Vegetative propagation of dwarf beans.)**
Gartenbauwiss., 1943, **17**: 250-4.
In order to facilitate the breeding of anthracnose-resistant strains the author experimented on the vegetative propagation of dwarf beans. Both whole leaves and pinnules formed roots readily in a box at a soil and air temperature of 30° C. and high atmospheric humidity. The later stages could not be observed owing to a severe hail storm. However, cuttings from bean shoots, which were rooted under the same conditions, were seen to develop into normal plants. The mother plants did not suffer from the treatment, replacing the part removed by 1 or 2 new shoots. The application of the root hormone Belvetan was beneficial.

795. JUEL, I. 631.531: 581.192: 577.15.04
Der Auxingehalt in Samen verschiedenen Alters, sowie einige Untersuchungen betreffend die Haltbarkeit der Auxine. **(The auxin content of seeds of different ages and some investigations on the keeping quality of auxins.)**
Planta, 1941, **32**: 227-33, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 40-1.
It was found at Copenhagen University that the auxin content of 38-year-old maize seeds and 26-year-old *Phaseolus vulgaris* seeds was 17·7 and 59·1% respectively of that of 1-year-old seeds. From the fact that the old seeds had lost their power of germination it is concluded that no relation exists between germination capacity and auxin content. Other experiments by the author showed that the degree of purity of auxin preparations has no influence on their keeping quality.

796. SEEMANN, J. 635.65: 632.111
Über die Bedeutung der Unterkühlung für die Selektion frostresistenter Bohnenpflanzen. **(The significance of the occurrence of damage from super cooling in the selection of frost resistant bean plants.)**
Züchter, 1942, **14**: 258-64, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 109-10.
In the course of an investigation on the selection of frost resistant strains from crosses of *Phaseolus vulgaris*×*P. multiflorus*, conducted at Müncheberg, Germany, special attention was given to the phenomenon of super cooling of the plants. The usual method of preventing this super cooling (syringing with water and covering with ice crystals) did not work. Temperature measurements of the bean plant (stalk and leaf) during cooling, carried out by means of a resistance thermometer, showed that the phenomenon occurred. After 6 hours the leaf temperature was −4·6° C. as against −3·6° C. air temperature. Then the leaf temperature rose suddenly by 2·4°, the formation of ice crystals releasing heat. Super cooling could be avoided by sprinkling the leaves with ice crystals at a temperature of somewhat above 0° C. and exerting slight pressure on the crystals. During a late frost period in May 1942, measurements showed that the same phenomenon occurred also in the open. It was proved that *Phaseolus* is not ice resistant. The temperatures of the stalk were found to be always higher than those of the leaf. Further experiments showed that the degree of super cooling depends on external conditions such as atmospheric moisture and soil temperature.

797. RICHARDS, B. L., AND BURKHOLDER, W. H. 635.65: 632.8
A new mosaic disease of beans.
Phytopathology, 1943, **33**: 1215-6.
Michelite pea beans grown in New York State suffered seriously from an outbreak of mosaic producing the typical symptoms of common bean mosaic, although the variety had so far been regarded as mosaic resistant. Another previously resistant pea bean variety, Robust, has also begun in recent years to exhibit mosaic symptoms. Inoculation tests indicated that the infection was caused by a new strain of the bean mosaic virus. The behaviour of a number of bean varieties towards the two virus strains is recorded.

798. ZAUMEYER, W. J., AND HARTER, L. L. 635.65: 632.8
Two new virus diseases of beans.
J. agric. Res., 1943, **67**: 305-28, bibl. 29.
The paper gives a detailed description of two new viruses and their symptoms on beans. The diseased plants were collected in Louisiana and California. The virus isolated from mottled pods has been named bean mosaic 4 (southern bean mosaic virus 1) or *Marmor laesiofaciens* sp. nov., the one obtained from mottled leaves is called bean mosaic 4A or *Marmor laesiofaciens* var. nov. None of 80 bean varieties or strains tested was fully resistant to either of the two viruses, but many can nevertheless be regarded as commercially resistant. The new viruses can be separated from a mixture of bean viruses 1 and 2 by heating above 60° C. or by diluting above 1: 2,000.

799. ZAUMEYER, W. J., AND HARTER, L. L. 635.65: 632.8
Inheritance of symptom expression of bean mosaic virus 4.
J. agric. Res., 1943, **67**: 295-300, bibl. 9.

800. REID, W. D. 635.65: 632.3+632.8
Resistance of beans against bacterial wilt, anthracnose, and bean mosaic.
N.Z. J. Agric., 1943, **67**: 411-2.
The resistance of 22 bean varieties to bacterial wilt, anthracnose and mosaic under New Zealand conditions is recorded in a table. All runner varieties were resistant to the 3 diseases, the Burnley Selections of Dun and Canadian Wonder were practically resistant, excepting the last-named variety's susceptibility to anthracnose.

801. STRAIB, W. 635.65: 632.451
Untersuchungen zur Biologie und Bekämpfung des Bohnenrostes *Uromyces phaseoli* (Pers.) Wint. **(Biology and control of bean rust.)**
Gartenbauwiss., 1943, **17**: 397-445, bibl. 54.
Bean rust, *Uromyces phaseoli*, causes damage in Germany, particularly in runner beans, though not on the same scale as in America, and teleutospores survive the winter. Its biology and control were studied at the Brunswick-Gliesmarode-branch of the Biologische Reichsanstalt für Land- und Forstwirtschaft. Specialization of the fungus occurs in Germany but differs from that in the U.S.A. None of the bean varieties tested remained free from rust, but some proved highly resistant to certain rust races. Reliable data on susceptibility can be obtained only by open air trials. Rust infected foliage should be burned with the bean straw and the poles should be disinfected with 0·1% formalin. Spraying with bordeaux is suggested as a preventive.

802. RUDORF, W., AND SCHRÖCK, O. 612.014.44: 635.655
Neuere Beobachtungen über den Photoperiodismus. **(New observations on photoperiodism.)**
Z. Pflanzenz., 1941, **24**: 108-33, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 6.
The photoperiodic reactions of soya beans of different origin were studied at Müncheberg, Germany. It was observed in the field that the temperature prevailing during

the influence of varying day lengths has a great effect on the time of flowering. These observations were examined more closely in the greenhouse under controlled conditions. It was found that higher temperatures in the early stage hasten the beginning of flowering. Only the temperature during the time of treatment is decisive, the beginning of flowering being hastened with rising temperature irrespective of temperature and photoperiodic conditions obtaining after treatment. At lower temperatures the photoperiodic treatment produces a flowering hormone which becomes effective only under the influence of higher temperatures. The intensity of reaction of soya beans from different origins to lower temperatures varies, the less exacting forms responding with greater intensity than forms which require warmth. At higher temperatures the relation is reversed. Treated plants show morphological and physiological changes. Growth is more stunted and the leaves are smaller, thicker and darker. Short-day treatment causes greater and earlier ramification than long-day treatment. The chlorophyll content is higher, the raw protein content lower. The number of flowers is increased, hence short-day treatment produces higher yields. From Manchurian material strains could be selected which in respect of important properties were well adapted to the long-day conditions prevailing in Germany.

803. GERICKE, S. 635.655: 631.415
Reaktions- und Düngungsansprüche der Sojabohne. **(pH and fertilizer requirements of the soya bean.)**
Bodenk. PflErnähr., 1941, **25**: 136-40, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 3.

At Berlin-Dahlem the highest yields of soya beans in weight, oil and protein content were obtained at a soil pH of 5·8-6·0 and with an application of P_2O_5 at the rate of 160 kg. per hectare. Phosphoric acid is also of great importance to the development of nodule bacteria and therefore indirectly to N-assimilation.

804. EARLEY, E. B. 635.655: 632.19: 546.47
Minor element studies with soybeans: I. Varietal reaction to concentrations of zinc in excess of the nutritional requirement.
J. Amer. Soc. Agron., 1943, **35**: 1012-23, bibl. 21.

In this study of varietal reactions of soybeans to zinc the author found that Hudson Manchu will tolerate a 8-12 times greater external concentration than will Peking. With few exceptions only both early maturity and large size of seed were associated with resistance and both late maturity and small size of seed with susceptibility.

805. SESSOUS, G. 635.655
Stand und Ziel von Anbau und Züchtung der Soja. **(The growing and breeding of soja beans; present position and aims.)**
Forschungsdienst, 1943, *Sonderh.* **16**, pp. 400-3, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 158-9.

806. CULLITY, M., AND ELLIOT, H. G. 635.656
Blue Prussian or blue boiler peas.
J. Dep. Agric. W. Aust., 1943, **20**: 218-21.

Notes on the cultivation and harvesting of Blue Prussian peas in Western Australia, where it is expected to devote up to 3,500 acres to this crop in 1944.

807. FUCHS, W. H. 635.656
Aussaatzeit und Entwicklungsgeschwindigkeit bei Gemüseerbsen. **(Time of sowing and rate of development in garden peas.)**
Pflanzenbau, 1943, **19**: 216-20, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 151-2.

Observations during several years showed that the temperature curve or the average temperature during the growing period determines the rate of development in garden peas and that under Central European conditions it is not merely supplementary to the day length factor. This may be explained by the fact that day-neutral forms occur or that in the case of extremely early and late sowings the critical day length is not exceeded.

808. REPP-NOWOSAD. 635.656: 631.432
Ein Kulturversuch mit Erbsen bei abgestuftem Bodenwassergehalt. **(A culture trial with peas under different conditions of soil moisture.)**
Forschungsdienst, 1941, **12**: 154-9, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 80.

The growth of peas was studied at soil-water contents ranging from 30 to 100% of the capacity of a garden soil. The osmotic pressure, determined in cross sections of the stem, was found to increase from 26·2 atm. at 100% water saturation to 42 atm. at 30%. There was a distinct jump at 40%, which proved to be the critical water capacity as determined according to Gradmann's evaporation method. Maximum yield and single seed weight were obtained at 70% water capacity.

809. KOPETZ, L. M. 635.656: 581.036
Über den Einfluss der Temperatur auf Wachstum und Entwicklung einiger Pflückerbsensorten. **(The influence of temperature on growth and development of some pea varieties.)**
Gartenbauwiss., 1943, **17**: 255-62, bibl. 3.

On the strength of photoperiod and darkening experiments a new term of evaluation, the so-called " pure temperature sum " is suggested. This sum, which may be regarded as a variety constant, is calculated by adding the daily average temperatures in the period between germination and flowering. This value can be computed for long-day plants only where no check from the day-length factor is to be expected, i.e. when the plant is in a state of " pure vegetative development ". If this state of development is not considered, the temperature sums will be variable values—as proved by short-day trials—and their introduction would be more or less useless. From results so far obtained the interaction between day-length and temperature-factor appears to function in such a manner that both values have a decisive influence on plant development; the extent of this influence, however, seems to depend largely on the time of its occurrence. Whereas under short-day conditions the temperature influence is definitely masked by the checking effect of the day-length factor, temperature alone will determine the development with sowings under long-day conditions. This entails a new point of view in the description and selection of varieties, a constant value independent of locality, season and temperature being introduced. [Author's summary translated.]

810. WOODMAN, R. M. 635.656: 631.8
The nutrition of the pea.
Ann. appl. Biol., 1944, **31**: 19-22, bibl. 2.

Sand-culture experiments with the pea at the Cambridge University School of Agriculture demonstrated that 8·24-32·96 p.p.m. of available nitrogen was the optimum range of concentrations for yield of peas, with a bias in favour of the lower half of the range; adequate supplies of nitrogen appeared to cause branching of the tops into two or more main stems. The best range of concentrations of available phosphorus was 2·73-10·92 p.p.m., while that for available potassium was 5·61-44·88 p.p.m. Deficiency of potassium caused marginal scorch followed by general scorch and death of the foliage progressively up the stem. Absence of boron had not a great effect with this plant, probably because the large seed possibly contains an appreciable amount of boron. [Author's summary.]

811. BIEBL, R. 635.656: 546.27
Borwirkungen auf *Pisum sativum*. **(The effect of boron on peas.)**
Jb. Bot., 1942, **90**: 731-49, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 75-6.

Boron in nutrient solutions was found to promote root

growth in peas. The water content of plants which had received boron was higher. A comparison of the water contents at saturation point made the difference particularly obvious. Transpiration at noon continued longer if the plants had received boron. Eventually the boron plants are found to show xerophytic characters.

812. Babb, M. F., and Bohn, G. W. 635.656: 632.4
Control of soil-borne organisms that cause rots of garden peas.
Phytopathology, 1943, **33**: 1098-1100, bibl. 1.

Tests were conducted at Cheyenne Horticultural Field Station of the Agricultural Research Association of U.S.A. to determine the most suitable method of obtaining good stands of peas in oil-jar cultures by treating seed and/or soil with various sterilizing agents. A table of 30 treatments in descending order of efficiency is given. The list is headed by soil treatment with 40% formaldehyde solution 1: 50, planting after 14 days, 1 litre per 30 seeds. The indications were that the diseases were soil-borne. There was little indication of seed-borne disease.

813. Dudley, J. E., Jr., and Bronson, T. E. 635.656: 632.753
The pea aphid on peas and methods for its control.
Fmrs' Bull. U.S. Dep. Agric. **1945**, 1943, pp. 14.

An illustrated description of the damage caused by the pea aphid, *Macrosiphum pisi*, its biology, natural enemies and such control measures as dusting with rotenone applied by itself and in conjunction with other insecticides, spraying with rotenone, vaporizing of nicotine under a 100 ft. gasproof cloth, dusting and spraying with nicotine and nicotine-oil combinations. Further instructions for the preparation of these insecticides and the time of their applications are given.

814. Gull, A. W., and Adams, A. B. 635.656: 632.76
Does early harvesting of peas check the pea weevil ?
J. Dep. Agric. W. Aust., 1943, **20**: 265.

Experiments at Muresk College, Western Australia, showed that peas gathered while the pods were still green, with the peas fully developed, were free from weevil (*Bruchus pisorum*) whereas practically every one of the peas allowed to ripen contained a weevil. It is suggested that growers should start trials in their own districts mowing a portion of the pea crop when the pods are full but still green and allowing them to dry off on the ground.

815. Tschermak-Seysenegg, E. v. 632.76: 635.65
Wirksame Mittel und Massnahmen zur Bekämpfung der Erbsen- und Fisolenkäferplage. (**The effective control of pea weevil and *Bruchus* (*Bruchidius*) *obtectus*.**)
Wbl. Landesbauernsch. Niederdonau, 1943, **7**: 107-8, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 163.

Owing to severe damage by the pea weevil and by *Bruchus* (*Bruchidius*) *obtectus* the growing of peas and beans for seed has ceased to be an economical proposition in the drier parts of Austria. It is suggested that an improvement of the very early and very late varieties, which tend to escape the main swarming period of the pests, would restore the position.

816. Stoller, B. B. 635.8
Preparation of synthetic composts for mushroom culture.
Plant Physiol., 1943, **18**: 397-414, bibl. 15.

The compost was made of fibrous waste such as spent licorice roots, spent tannery nuts, bark and leaves or straw which had undergone microbial decomposition. Straw requires 4-5 weeks composting. With licorice the best yields are obtained by composting small piles of licorice roots for 8 days; shorter and longer periods of composting reduce yields. The compost should produce about 13 lb. N., 4 lb. P_2O_5 and 10 lb. K_2O per ton of fibrous material containing 70% moisture. The deficiencies are made up by the addition of the necessary elements. The addition of potash to synthetic composts prepared from spent licorice roots and brewers' grains almost doubled the yield of mushrooms compared with similar composts receiving only N and P_2O_5. A process is described in which tannin extracts are combined with nitrogenous materials in order to avoid the lengthy outdoor composting period and to produce greater yields of mushrooms. The pH of the compost and the control of weed and disease fungi are discussed.

817. Mader, E. O. 635.8
Some factors inhibiting the fructification and production of the cultivated mushroom, *Agaricus campestris* L.
Phytopathology, 1943, **33**: 1134-45, bibl. 6.

It was found that volatile substances accumulate where mushrooms are grown and that they have a detrimental effect on their growth and fructification. Such accumulation occurs in mines with poor ventilation and accounts for low yields. The substances can be removed by washing the atmosphere with alkaline potassium permanganate solutions, mineral oil or activated charcoal. The successful use of these chemicals suggests that the volatile substances belong to the class of non-saturated hydrocarbons.

818. Kligman, A. M., and Penny, J. S. 635.8: 632.3/4
Some miscellaneous diseases of mushrooms.
Phytopathology, 1943, **33**: 1090-3, bibl. 1.

Fusarium spp., mummy disease, bacterial pit and bacterial blotch of cultivated mushrooms in U.S.A. are discussed.

819. Kehl, H. 635.8
Zur Keimungsphysiologie der Champignonsporen. (**The physiology of germination in mushroom spores.**)
Gartenbauwiss., 1942, **17**: 156-70, bibl. 16.

Flachs, K. 635.8: 632.77
Die Trauermücke *Neosciara solani* Winn. als Schädling an Champignonkulturen. (***Neosciara solani* as a pest of mushroom cultures.**)
Prakt. Bl. Pflb., 1941, **19**: 1-2, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 68.

820. Tuba, J., and others. 577.16: 635.937.34
On sources of vitamin C. I. Rose hips.
Canad. J. Res., 1943, **21**, Sec. A, pp. 363-73, bibl. 10.

Hips of *Rosa acicularis* were richest in vitamin C of all wild roses tested, containing 1,800-3,500 mg.% in the wet flesh or about 4·5-7·6% on a dry basis. The cultivated varieties examined were poorer in ascorbic acid with the exception of *R. laxa* which contained 3,000-4,000 mg.% in the wet flesh or 8-10% on a dry basis. Some preliminary observations in respect of rose hip preservation are reported and methods are suggested. The material was found remarkably resistant to heat treatment. Also rose leaves and bark with a vitamin C content of 300-500 mg.% are relatively rich in ascorbic acid.

821. Gustafsson, Å., and Schröderheim, J. 635.937.34: 577.16
Ascorbic acid and hip fertility in *Rosa* species.
Nature, 1944, **153**: 196-7, bibl. 8.

The ascorbic acid content of the hips of hybrids between *Rosa canina* II and *R. rubiginosa* was studied some years ago. With *R. canina* as the mother the hybrids form large hips, rich in ascorbic acid but largely infertile through absence of seed. With *R. rubiginosa* as the mother the hips are late-ripening, bottle-shaped and normally fertile, containing a high number of seeds but having a low content of ascorbic acid. In 1942 the ascorbic acid and the seed content were determined in a large number of biologically heterogeneous samples of *Rosa canina* types from various parts of Sweden. Statistical analysis showed the fertility of the hips to have an obvious and significant influence on

he amount of ascorbic acid. It is suggested that ascorbic cid (or a precursor or derivative) may play a direct part in eed and kernel development, so that it is stored up and not onsumed if the seeds are few and the ascorbic acid is not eeded in metabolism. The results point to a reconsidera- ion of the connexion between chromosome number and itamin C content in apples, tomatoes and other fruits. Especially in apples, which resemble rose receptacles in onstruction, it may be conceived that the higher vitamin C ontent of triploids as compared to that of diploids is due o the infertility itself as well as to the chromosome number nd the genotype. It is pointed out that for the full ripening f a *Rosa* receptacle only one or two seeds are required. R. *canina* and *R. rubiginosa* hybrids flower and fruit freely, lthough the number of seeds per hip is very low.

822. HARRISON, J. W. H., AND JACKSON, G. A. D. 635.937.34: 577.16
Ascorbic acid and hip fertility in *Rosa* species.
Nature, 1944, **153**: 404, bibl. 1.

The writers are unable to confirm the negative correlation vhich Gustafsson and Schröderheim seek to establish [see previous Abstract] between hip fertility in roses and amount f ascorbic acid. They have under observation a hybrid etween *Rosa dumetorum* ♀, 941 mg. ascorbic acid per 00 g. of flesh, and *R. mollis* ♂, 724 mg. The hybrid is f extremely low fertility with an average of only 1·28 chenes per hip, yet its ascorbic acid content is 941 mg. Ascorbic acid content in the writers' opinion is purely a natter of heredity. The further criticism is made that the enetic heterogeneity of the material used was so great and ts ascorbic acid heredity so diverse that no mathematical treatment could yield figures of real significance. Gustafsson and Schröderheim's implication that at least one fruit must be present to effect full ripening of the receptacle is contrary to the writers' experience, of which one example out of many is quoted.

823. MELVILLE, R. 635.937.34: 577.16
Ascorbic acid and hip fertility in *Rosa* species.
Nature, 1944, **153**: 404-5, bibl. 3.

The statement of Gustafsson and Schröderheim [see above] affirming the existence of a negative correlation between rose hip fertility and ascorbic acid content of the flesh is challenged. In the writer's investigations undertaken with Dr. Magnus Pyke, low vitamin content was found associated with both the highest and lowest ranges of pip content. If the suggested negative correlation exists, differences in vitamin content of hips from individual bushes should vary from year to year according to the number of achenes matured. The figures for *R. canina* and *R. rubiginosa* given by the Swedish investigators are contrary to this theory and the observations of the writer, though limited, are generally unfavourable. Examples are given. The diversity of vitamin content and fertility as observed by Gustafsson and Schröderheim may be regarded as examples of a kind of variation not uncommon among hybrids and genetical in origin.

824. NEWTON, W. 635.937.34
Combining beauty with utility in rose breeding.
Sci. Agric., 1944, **24**: 304-6, bibl. 3.

The suggestion is made that roses might be bred to combine beauty and high ascorbic acid content of hips.

FLOWER GROWING.

825. HICKS, F., AND TINCKER, M. A. H. 635.936.69: 631.589: 663.61
A simple method of growing carnations and other plants in sand.
J. roy. hort. Soc., 1944, **69**: 112-4.

A simple method of growing plants in sand on a commercial cale has been evolved at the Embrook Nurseries, Wokingham. The main feature is the application of chemicals directly to the surface of gravel and sand. Small additions of sand are added as a diluent and the nutrients are transferred to the roots in solution by subsequent watering. Carnations were grown in long shallow containers, about 6 feet long by 5 feet wide and 6 inches deep, with a central groove for drainage. The best results were obtained in a mixture of 25% coarse gravel, 30% fine gravel, 40% coarse and and 5% fine sand. Similar methods were employed for growing tomatoes and chrysanthemums in pots. In all cases the yields were at least equal in quality and quantity o those obtained by soil culture.

826. HICKS, F. 635.936.69: 631.589: 663.61
Sand culture [carnations].
Carnation Yearb., 1943, pp. 15-8. Brit. Carnation Soc., 23 Russell Chambers, Covent Garden, London, W.C.2. 3s. 6d.

An account of an experiment on the sand culture of perpetual lowering carnations by a commercial grower. Comparison s made with similar varieties grown in soil, other conditions being comparable. The sand cultures gave a greater output f flowers, halved the cost of manure, abolished the problem f stable manure and of weeding, gave a 25% increase in keeping quality of the flowers and gave complete control ver the plants.

827. TINCKER, M. A. H. 635.936.69: 631.589: 663.61
Carnations grown in sand and gravel.
Carnation Yearb., 1943, pp. 19-30. Brit. Carnation Soc., 23 Russell Chambers, Covent Garden, London, W.C.2. 3s. 6d.

The author, representing the Royal Horticultural Society, co-operated in the sand culture experiments mentioned in the previous abstract and he here discusses them from the scientific aspect. A mixture of fine gravel and coarse sand gave good results as a rooting medium, but when the proportion of coarse sand was low (13%) and that of gravel too high, the rate of drying was too rapid. The nutrient mixtures, of which several examples are given, were applied between the rows at the rate of 2 lb. to 52 sq. yds. at weekly intervals in spring and summer and fortnightly in winter. The watering that followed washed the salts into the sand. The pH value was practically neutral. Nitrates varied from 250 p.p.m. to 0. Ammonia was usually at the 10-15 p.p.m. level, nitrites less than 2 p.p.m., potash did not often exceed 350 p.p.m. and rarely fell below 80 p.p.m. of the bulk, magnesium fluctuated between 70 and 30 p.p.m., soluble calcium between 600 and 850 p.p.m., soluble phosphates 25 and 50 p.p.m. of the bulk. A temporary accumulation of salts soon ceased, presumably having drained off. The only accumulation of any size was that of magnesium, amounting to 500 p.p.m. of the bulk with traces of boron, iron, manganese, and aluminium. Yields for 2 years combined showed an increase of 4% over plants grown in soil. The method is one requiring skill and attention and conditions of temperature, light, shade and ventilation are of the same importance as before.

828. MOYER, D. T., AND OTHERS. 663.61: 631.589
An installation of large sand-culture beds surmounted by individual air-conditioned greenhouses.
Plant Physiol., 1943, **18**: 334-44, bibl. 12.

A large sand-culture installation is described, with automatic equipment for sub-irrigating the beds and facilities for measuring transpiration, photosynthesis, and root respiration. The beds are surmounted by airtight individual greenhouses, supplied with washed and filtered air free from sulphur dioxide, thus permitting control of the gaseous environment. [Authors' summary.]

829. BRIGGS, G. B. 631.84: 546.27
Effect of boron in the substrate on the rate of nitrate absorption and on nitrogen distribution in nasturtium.
Plant Physiol., 1943, **18**: 415-32, bibl. 34.
In the absence of an adequate supply of boron nasturtiums grown in nutrient solution showed a progressive decrease in nitrogen absorption and air accumulation of ammonium and carbohydrates as well as soluble organic nitrogen. Thus deficiency of boron appears to inhibit the amination of carbohydrate derivatives, while the lower proportion of total soluble to insoluble organic nitrogen in the stems and roots of plants showing boron toxicity symptoms suggests an accelerated synthesis of complex nitrogenous compounds.

830. HILLIER, E. L. 635.977
One hundred and fifty of the most beautiful trees.
Published by E. L. Hillier, Winchester, England, 1944, pp. 4.
A list, including 50 conifers and some which can be classed as shrubs, of decorative trees which can be grown in different parts of the British Isles.

831. ENGLISH, L. L. 635.9: 632.944
Fumigation of camellias and azaleas with methyl bromide.
J. econ. Ent., 1943, **36**: 737-43, bibl. 8.
The margin of safety allowing for perfect kill of scales without injury to the host allows practical fumigation of camellias and azaleas at any desired temperature from 60° to 100° F. provided the plants are shaded at least 24 hours after fumigation. Details of treatment with methyl bromide are given.

832. HAWKER, L. E. 635.944: 632.48: 632.95
Notes on basal rot of narcissus. I. A comparison of various methods of using formalin in connection with the hot-water treatment against eelworm. II. Infection of bulbs through dying roots in summer.
Ann. appl. Biol., 1943, **30**: 323-4, bibl. 9, and **30**: 325-6, bibl. 6.
Control of basal rot of narcissus was equally good and harmless to growth and flowering when 0·5% formalin was included in the hot-water bath or used as a cold or warm steep afterwards, though losses from basal rot may follow if formalin treatment be delayed.
II. Inoculations *in situ* of roots of narcissus plants with cultures of *Fusarium bulbigenum* reduced rotting in the ground or subsequently during storage, provided the soil was wet at and after the date of inoculation. It was found also that penetration of the root by the fungus was possible without root injury. The period of survival of the fungus in the soil in the absence of narcissus is unknown but may be considerable. Infection of clean stock only takes place when it is planted in soil previously holding a diseased crop or when the plot is artificially contaminated, so that it seems improbable that the fungus is universally present in the soil.

833. HAWKER, L. E. 635.944: 632.48: 632.95
Notes on basal rot of narcissus. III. Eradication of the disease from narcissus stocks by repeated use of formalin in the hot-water bath.
Ann. appl. Biol., 1944, **31**: 31-3, bibl. 5.
The addition of 0·5% of formalin to the water used in hot water treatment against eelworm was sufficient to reduce a severe attack of basal rot (*Fusarium bulbigenum*) to negligible proportions. In only one instance was a second treatment required. The hot water treatment alone offered no check to the disease.

834. STORCK, A. 635.938.46: 631.535
Über den angeblichen Einfluss der Grösse der zu Blattstecklingen dienenden Blätter auf Habitus und Wüchsigkeit der Nachkommen bei Lorraine-Begonien. **(The supposed influence of the size of leaves serving as leaf cuttings upon the habit and growth-rate of the resulting plants in Lorraine begonias.)**
Gartenbauwiss., 1942, **17**: 133-50, bibl. 16.

GERICKE, S. 635.939.98: 631.85
Die Wirkungen des Nährstoffs Phosphorsäure in der Chrysanthemenkultur. **(The significance of the nutrient phosphoric acid in chrysanthemum cultivation.)**
Gartenbauwiss., 1943, **17**: 310-32, bibl. 16.

GÄUMANN, E. 635.938.86: 632.452
Über den Fuchsien-Rost. **(Fuchsia rust.)**
Phytopath. Z., 1942, **14**: 189-91, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 132.

DENNY, F. E. 632.944
Effect of a few hours of chilling upon the germination of gladiolus corms subjected to an artificially prolonged rest period.
Contr. Boyce Thompson Inst., 1942, **12**: 375-86, bibl. 4.

MADER, E. O. 635.937.34: 631.8
Effect of mineral nutrition on flower production of own-rooted roses and the incidence of black-spot.
Phytopathology, 1943, **33**: 1185-9.

REEVE, R. M. 581.144: 635.976.34
Comparative ontogeny of the inflorescence and the axillary vegetative shoot in *Garrya elliptica*.
Amer. J. Bot., 1943, **30**: 608-19, bibl. 28.

GAUCH, H. G., AND WADLEIGH, C. H. 663.61: 631.589
A new type of intermittently-irrigated sand culture equipment.
Plant Physiol., 1943, **18**: 543-7.

CITRUS AND SUB-TROPICALS.

835. PIERES, R. B., HAYWARD, K. J., AND SPERONI, H. A. 634.3(82)
Los citrus. **(Citrus cultivation in Argentina.)**
Bol. Frut. Hort. B. Aires, 1939, Vol. **4**, No. 39, pp. 288.
This is a complete and up to date account of citrus growing with special reference to conditions in Argentina. The authors are respectively the Director, the Entomologist and the Plant Pathologist of the Concordia Experiment Station. A chapter on packing and storage has been added by the editors. There are some interesting notes on rootstock effects under local conditions. A distribution map (1936) shows that orange growing is not yet very widespread and indicates suitable localities for exploitation, noting whether the district is early, intermediate, or late. The sections on pests and diseases are comprehensive and well illustrated and there is an excellent index.

836. NAIK, K. C., AND SUGURAPPA, S. 634.31-1.564
Grading of Sathgudi oranges.
Ind. Fmg, 1943, **4**: 243-6.
Recommendations for the grading of seed-propagated Sathgudi oranges in Southern India based on analytical figures from representative samples.

837. RICHARDS, A. V. 634.337
Studies on the propagation of seedless Tahiti lime.
Trop. Agriculturist, 1942, **98**: 3: 9-12, bibl. 3.
The Tahiti seedless lime recently introduced into Ceylon is highly resistant to citrus canker, to which the local Ceylon limes are very susceptible. It is liable to scab which is

easily controlled by overhead shade and spraying. In Ceylon it does best on rough lemon stock, and fails on pummelo (*Citrus maxima* Merr.) and sour orange. On the latter stock scion overgrowth, leaf fall and dieback are prominent signs of incompatibility. The Tahiti lime strikes readily from cuttings, but the resulting plants seldom make satisfactory trees.

838. Pravdin, L. F. 634.334-2.111: 581.1
The effect of root cooling on transpiration and carbohydrate content in lemon. [Russian.]
Trud. bot. Inst. Akad. Nauk, S.S.S.R., Ser. IV, Eksp. Bot., 1940, No. 4, pp. 171-85.

In the region of the Caucasus where lemons are grown, the temperature of the soil may be 4° C., and of the air 15° to 20° C. during the winter. It was therefore decided to study the influence of low temperature upon the roots in conjunction with different air temperatures and different degrees of soil moisture, by observing the changes to which they gave rise in the rate of transpiration, and the content of carbohydrates in the leaves. A parallel series of observations was carried out on willow and poplar. One-year-old rooted cuttings of *Citrus limonum* were obtained at a place between Soči and Suhumi, and the whole experiment was done at Leningrad. The cuttings were planted in 5-litre glass vessels containing soil, the water-holding capacity of which was 92%. The experiment was begun 6 months after the cuttings had been planted in these vessels, but the main part of it was carried out 1 to 1½ years after planting. Cooling of the roots reduced transpiration which, after diminishing rapidly, began to rise sharply until the leaves started to fall off and the plants to dry out and sometimes die. Absorption of water by the roots ceased at about 4° C., and the plant was usually killed at 2° C. The critical temperature when transpiration first began to be affected and the leaves to fall was below 6° C. The plants were more resistant to cold soil when its moisture content was 40% than when it was 60 or 80%. Though there was not always an easily perceptible connexion between the temperature at the roots and the moisture content of the leaves, it can, in general, be said that the moisture content of leaves of the treated plant was equal to, or sometimes greater than, that of control plants. The age of the leaves must be taken into consideration. Cooling of the roots reduced the size of the stomata in the old but not in the young leaves. Up to the seventh day after reducing the temperature to 6° C., the content of sugar and starch both in old and young leaves increased. After 15 days the amount of carbohydrates fell but still remained above that in the control plants. Photosynthesis was more active when the soil moisture was at 40% than at 60%. The amount of chlorophyll became less as the temperature at the roots was reduced. The maximal quantity of chlorophyll and the best growth of the plant were observed with a soil moisture of 60%.

839. Semakin, K. S., and Moroz, E. S. 634.3-2.111-1.8
The effect of mineral manures upon cold-resistance in citrus. [Russian.]
Trud. bot. Inst. Akad. Nauk, S.S.S.R., Series IV, Eksp. Bot., 1941, No. 5, pp. 198-219.

Young trees of lemon, orange, ponderosa, Italian mandarin, grapefruit and Unshiu mandarin were manured with KCl; KH_2PO_4; KNO_3; $KH_2PO_4+KNO_3$; $KCl+NH_4NO_3$; NH_4NO_3; $KNO_3+KH_2PO_4+Na_2HPO_4$; and $NaNO_3+KH_2PO_4+Na_2HPO_4+NH_4NO_3$. In order to appraise such powers of resistance to cold as might have been conferred upon them by these manures osmotic pressure and other indications were measured. Though no connexion between osmotic pressure and manurial application could with certainty be identified, the degree of the former could be controlled by manuring and was a constituent item in the so-called "injury coefficient", the definition and use of which the author explains. The experiments nevertheless showed that resistance to cold could be brought about by means of manures, due consideration being given to the rate and time of application, as well as the kind of manure applied; those found to be the most effective were NH_4NO_3 and the mixtures, $KH_2PO_4+KNO_3$, $NaNO_3+KH_2PO_4+Na_2HPO_4+NH_4NO_3$ and $KCl+NH_4NO_3$. It was observed that manures which contained nitrogen and increased the amount of it in the leaves exerted a favourable effect, for the water content in such leaves was reduced and resistance to cold thereby increased. The resistance of citrus plants to cold could be increased not only in those species which are by nature and inheritance favoured in this respect, but also in those which are relatively less so favoured. The maximum doses of manure which could bring about resistance to cold did not necessarily retard growth in the aerial portions of the trees.

840. King, A. S. 631.83
Equipment for spreading ammonium nitrate fertilizer.
Calif. Citrogr., 1943, **29**: 37.

The apparatus, which is diagrammatically illustrated, spreads ammonium nitrate in liquid form, thus avoiding the trouble caused by caking. The material required can be assembled on the farm and consists only of a metal drum, a short piece of ¾-in. hose, a ¾-in. gate valve and a length of 1-in. or 1¼-in. pipe from 8 to 12 ft. long to act as a spreader. The pipe is drilled with ⅛-in. holes and equipped with a T hose connexion in the middle. The distance between the holes depends on the speed of the conveyance on which the assemblage is mounted, namely, every 6 inches at 8 miles per hour and 9-12 inches for a slower moving vehicle.

841. Školjnik, M. J., Abaškin, V. K., and Grininger, M. P. 634.334-1.85+546.27
The influence of boron and phosphorus on the growth, flowering and fruit-bearing of the lemon. [Russian.]
Trud. bot. Inst. Akad. Nauk S.S.S.R., Ser. IV, Eksp. Bot., 1940, No. 4, pp. 111-26.

Three-year-old lemon trees were grown in tubs at Soči. Boron at the rate of 0·3 and 0·8 mg. and phosphorus at the rate of 0·15 and 0·45 mg. per kg. of soil were applied, separately and in combination, at stated intervals during the period of the experiment, 1936 to 1938. Vegetative growth, flowering, fruit formation, and an early yield were encouraged by the small dose of boron alone. The boron effect was also possible in combination with phosphorus. Phosphorus alone had no marked influence. The soluble and total carbohydrates in the leaves were increased in amount by both boron and phosphorus, alone and in combination, though not to the same degree by each. In the fruit, the total dry matter was increased by both elements combined and by phosphorus alone; the latter, however, reduced the soluble carbohydrates but increased the amount of citric acid. The larger of the two doses of boron had a depressing effect on growth and fruit formation.

842. Greig, A. M. W. 634.3-1.542
Pruning of citrus trees.
N.Z. J. Agric., 1944, **68**: 119-22.

The author considers that, contrary to common belief, citrus trees require pruning if they are to be kept in full productive vigour. In this article the pruning of all citrus trees, except lemon, which produces its fruit on laterals rather than as the orange on terminal twigs of the current season's growth, is fully described. A note on pruning treatment after frost is included.

843. Turrell, F. M., Sokoloff, V. P., and Klotz, L. J. 634.3-2.19
Structure and composition of citrus leaves affected with mesophyll collapse.
Plant Physiol., 1943, **18**: 463-75, bibl. 23.

Mesophyll collapse is the name given by Fawcett to a

pathological condition observed in the leaves of orange trees in which yellow, translucent, sunken areas form, apparently on account of some physiological disturbance. Histological examination in recent work at Riverside showed enlarged sponge cells interspersed with collapsed sponge cells, reduced intercellular spaces and chlorophyll-depleted spongy mesophyll cells. In the collapsed tissue Ca was invariably lower and K, Mg, Na, Cl and P were higher than in normal tissue. There was no consistent difference in the S contents of collapsed and normal tissue or in CO_3 ash percentage. The SO_4 ash percentage was consistently lower in the collapsed tissue. It is surmised that mesophyll collapse is related chemically to an unbalance in the ionic constituents of the plant. It is possible that this unbalance may be due to excesses or deficiencies in soil constituents.

844. Woglum, R. S., and Landon, W. E. 634.31-1.548
Navel fruit drop. An analysis of factors possibly contributing to condition following spraying with oil.
Calif. Citrogr., 1944, **29**: 59.

Extensive damage to citrus trees following spraying with heavy oil in certain years, 1928, 1934 and 1938, is associated with the exceptionally hot dry summers of those years. The physiology of oil influence on the tree has not been fully investigated, but the oil certainly raises the temperature of the fruit and possibly that of the leaves and twigs also. Possibly, too, the absorption of oil into the plant cells interferes with the movement of water. The application of oil spray so long as 2 months before the onset of extreme hot weather has been known to cause fruit drop, while other contributory factors rendering drop more probable are the shallow cultivation now becoming prevalent which brings the roots closer to the surface, unbroken irrigation furrows without cross checking, and the irregular mixtures and spraying with consequent variation in build-up on the trees due to the labour problem. As preventives it is suggested that the lightest oil consistent with efficiency should be used and that the trees should be adequately supplied with moisture.

845. Frezzi, M. J. 634.31-2.8
La lepra explosiva del naranjo. **(Nail head rust of citrus in Argentina.)**
Bol. Frut. Hort. B. Aires, 1940, Vol. 5, No. 46, pp. 16, bibl. 10.

The disease, suspected to be of virus origin, develops as round or oval spots on twigs, leaves and fruit of orange and other citrus fruits. From experiments carried out at the Phytopathology Laboratory at Bella Vista (Corrientes), Argentina, the vector appears to be the mite, *Tenuipalpus pseudocuneatus*. An infected tree continues to produce pustules on its developing shoots when no mites are present. Infected rootstocks of various kinds, including sour orange and rough lemon, did not contaminate the scions, which all grew vigorously. It was noted, however, that the percentage of failures to unite was higher in the case of heavily infected stocks and that the scion buds were later in starting. Control consists of pruning out all dead and weakened wood and spraying with lime-sulphur, a mixture which has the advantage of dealing with the citrus rust mite also, a result not achieved with bordeaux mixture. Manuring infected and treated trees to induce vigour has given no significant result but is probably beneficial. Locusts are erroneously thought to cause a development of the disease. The fact is that the twig and branch lesions are simply made more apparent by the destruction of the foliage. Birds' nests constructed of diseased and mite infested twigs are, however, a certain focus of infection. Shrubby undergrowth is probably one means of passage for the vector from tree to tree.

846. Frezzi, M. J., and Mácola, T. 634.3-2.411
Phytophthora palmivora causante de la podredumbre morena de los frutos cítricos en Córdoba (Argentina). **(*Phytophthora palmivora* as a cause of brown rot of citrus.)**
Rev. argent. Agron., 1943, **10**: 227-30, bibl. 9.

A note on the identification of *Phytophthora palmivora* as one of the causal fungi of citrus brown rot and here reported for the first time from Argentina.

847. Speroni, H. A. 634.3-2.411
Tizon gomoso de las ramitas de los citrus. **(Citrus brown-rot in Argentina.)**
Publ. misc. Minist. Agric. B. Aires **114**, 1942, pp. 4.

The disease shows itself by a rotting of the fruits and by gum-exuding lesions having a scorched appearance on the twigs. It may also produce fissuring at the bud union. The causal agents are *Phytophthora citrophthora* and *P. parasitica*. The disease is favoured by atmospheric humidity and an even, moderate temperature, such as 20° C. Preventive measures consist in not planting citrus in which the bud union is less than 40 cm. above soil level. Pruning cuts in nursery trees should be treated with tar or some similar substance, the plantations should be well drained and trunks, branches and underlying soil surface sprayed regularly with bordeaux mixture. Curative measures consist of the burning of all affected fruits, twigs, etc., pruning back injured twigs to 3 cm. below the lesion, cutting out and disinfecting trunk lesions, a suitable mixture for the purpose being 1 kg. sulphate of copper, 2 kg. quicklime, 10 litres water, compounded as for bordeaux mixture. After the treatment a general spraying with bordeaux mixture is advised. If, 2 or 3 months after treatment, fresh gumming exudations occur in the wounds this is probably a natural reaction and not a fresh outbreak of disease. Three months after disinfection the wounds should be tarred.

848. California Fruit Growers' Exchange, Bureau of Pest Control. 634.3-2.411
Watch for brown rot.
Calif. Citrogr., 1943, **29**: 48.

A less expensive formula of 1 lb. copper sulphate, 1 lb. lime, 100 gal. water is recommended as a substitute for the standard formula 3 lb. copper sulphate, 3 lb. hydrated lime, 100 gal. water against brown rot of citrus. The weaker mixture gives satisfactory control without risk of injury, even if thoroughly applied. Brown rot formula in fumigated orchards recommended by the Citrus Experiment Station, Riverside, consists of 1 lb. copper sulphate, 5 lb. zinc sulphate, 4 lb. hydrated lime, 100 gal. water. A table is given for calculating safe dosages in commercial preparations of zinc-copper-lime powdered mixtures to ensure that not more than $\frac{1}{4}$ lb. metallic copper is incorporated per 100 gallons.

849. Camp, A. F. 634.31-2.19
Informe sobre el problema de la podredumbre de las raicillas del naranjo. **(Root rot of orange in Argentina.)**
Publ. misc. Minist. Agric. B. Aires **139**, 1943, pp. 30.

The author was asked to report to the Argentina government on the root rot disease which is causing much damage to oranges, particularly those on sour stock in Argentina. The disease is probably a result of a fluctuating water table combined with the fact that sour orange, normally shallow rooting, shows deep rooting when budded with sweet orange and other varieties, for reasons which are suggested. These deep roots are then drowned when the water rises. Other stocks which are shallow rooting and remain so are unaffected. On the other hand compared to Florida, Argentina citrus soils are variable and poor. A scheme of fertilizer experiments is proposed whereby the deficiencies can be ascertained. Methods of planting on raised mounds

of good soil are discussed, as are many other cultivation questions, including the prevention of erosion, the provision of proper drainage, of run off and of cover crops, and all need investigation. The author considers that while the time at his disposal was too short for him to conduct the comprehensive studies required, his suggestions may put the technical workers on the right lines for conducting the necessary long-term experiments.

850. VERGANI, A. R. 634.3-2.654.2
La naranja " negra " y el acaro que la produce.
(The citrus rust mite in Argentina.)
Bol. Frut. Hort. B. Aires, 1940, Vol. 5, No. 45, pp. 14, bibl. 12.

An account of the citrus rust mite, *Phyllocoptruta oleivorus*, in Argentina, where it is becoming prevalent in certain localities. Climate exercises a certain control. Lime-sulphur or sulphur applied as a dust in suspension or in solution will give good control, but, since it does not affect the eggs, a second application will have to be given a week later. The proper time of application is from mid-October to the end of November. The article is well illustrated with coloured plates.

851. LEWIS, H. C. 634.334-2.654.2
Injury to citrus by *Tenuipalpus* mites.
Calif. Citrogr., 1944, **29**: 87.

Tenuipalpus mites of an undetermined species (possibly *T. bioculatus* McGregor) have recently caused considerable damage to lemon fruits at Porterville, California. The fact is recorded because *Tenuipalpus* mites, though long established in California, seldom cause much injury. In a previous outbreak at Corona control was obtained with one sulphur dusting.

852. MCGREGOR, E. A. 634.3-2.73
Notes on the resistance of citrus thrips to tartar emetic.
Calif. Citrogr., 1944, **29**: 62, bibl. 8.

After the use of tartar emetic against citrus thrips, *Scirtothrips citri*, in lemon orchards near San Fernando, California, a strain of thrips became established that would feed freely on the poison without injury. It has been established that thrips are definitely nourished by sugar and it is thought possible that the sugar contained in the residue on treated trees has been an important item of diet in nourishing and building up thrips populations where resistance to tartar emetic has developed.

853. RIPLEY, L. B., HEPBURN, G. A., AND ANDERSSEN, E. E. 632.77: 634.3
Fruitfly migrations in the Kat River Valley.
Sci. Bull. S. Afr. Dep. Agric. **204** (*Plant Industry Ser.* **49**), 1940, pp. 17, bibl. 4. 3d.

A discussion of the movement of the Mediterranean fruit fly (*Ceratitis capitata*) and of the factors affecting its spread in citrus orchards of the Kat River Valley.

854. EBELING, W., AND LADUE, J. P. 634.3-2.752
Field experiments with oil-toxicant sprays for red scale.
Calif. Citrogr., 1943, **29**: 32, 40, 52, 53, bibl. 11.

The results of these experiments carried out at Riverside Experiment Station indicate that finely ground cubé root, 200 mesh and containing 5% rotenone, used as a spray at 1 lb.: 100 gal., is an effective supplement to spray oil against red scale. The use of ground root makes a mutual solvent citrus unnecessary and thus eliminates a source of variability as compared with toxic solutions or complete oil-toxicant solutions and reduces costs. The addition of a toxicant increases mortality since it is difficult, owing to rapid absorption by the bark, to apply sufficient oil alone to plug all the spiracles of the scale.

855. BOYCE, A. M. 632.951: 634.3
Gesarol.*
Calif. Citrogr., 1944, **29**: 76-7.

Gesarol and Neocide are proprietary products in which the toxic ingredient is 2, 2 bis (parachlorophenyl) 1, 1, 1-trichloroethane or more practically dichloro-diphenyl-trichloroethane, abbreviated to DDT or alternatively GNB-A. The latter initials are preferable to avoid confusion with the new compound DD (dichloropropylene and dichloropropane). The terminal letter A is only added when the product is made in America. GNB is toxic to many species of insects at relatively small concentrations, remains effective for a long time following application, is not affected by exposure to sunlight, is not soluble in water but is soluble in various solvents and petroleum oil, is non-injurious to many kinds of plants and will probably not prove expensive. It has given promising control of a wide range of agricultural and household insect pests. In certain laboratory experiments made at Riverside Citrus Experiment Station on California red scale, *Aonidiella aurantii*, the use of GNB-A in petroleum increased the kill of mature females and inhibited young scales from settling and developing for 50 days, by which time the experimental oranges had decayed. Even in solvents which did not kill adult scale the inhibition phenomenon was pronounced and did not diminish through the whole life of the fruits. The residue of the compound is difficult to remove by water washing or brushing. Field experiments by other workers have given good results with red scale and various thrips and on the citrus mite, *Eriophyes sheldoni*.

856. BUSBEY, R. L., HOWARD, L. B., AND FULTON, R. A. 634.3-2.952
Adherence and retention of sulfur on citrus foliage.
J. econ. Ent., 1943, **36**: 516-8, bibl. 4.

No difference was detected in the rate of weathering of sulphur dust deposits on citrus trees in various climatic conditions in different sections of southern California or in the amount of sulphur deposited at top and bottom of the tree, but there was a marked variation in the deposits on individual trees. Heavy rains will remove a large portion of the sulphur on citrus.

857. CALIFORNIA FRUIT GROWERS' EXCHANGE, BUREAU OF PEST CONTROL. 634.3-2.19: 546.711
Manganese sprayed trees susceptible to fumigation injury.
Calif. Citrogr., 1943, **29**: 42.

Various degrees of defoliation and twig burning have been found to occur on citrus, especially oranges, when fumigation has followed within 5 months of application of manganese spray. The injury is accentuated when fumigation is carried out under wet tents during nights of high humidity.

858. KRUG, C. A., AND BACCHI, O. 634.3
Triploid varieties of citrus.
J. Hered., 1943, **34**: 277-83, bibl. 25.

VAN DE MERWE, C. P. 634.3-2.52
The citrus psylla (*Spanioza erytreae*, del. G.).
Sci. Bull. S. Afr. Dep. Agric. **233**, 1941, pp. 12, bibl. 7, being *Ent. Ser.* No. 8.

YUST, H. R., NELSON, H. D., AND BUSBEY, R. L. 632.752: 634.3
Comparative susceptibility of two strains of California red scale to HCN, with special reference to the inheritance of resistance.
J. econ. Ent., 1943, **36**: 744-9, bibl. 10.

MCGREGOR, E. A. 634.3-2.73
Toxicity of anabasine to the citrus thrips.
J. econ. Ent., 1943, **36**: 805.
Evidence of toxicity given.

* See also 549, 624, 625.

859. EASTER, S. S., AND PHILLIPS, G. L. 633.492-2.944
Effect of fumigation with methyl bromide and paradichlorobenzene on germination and productivity of seed sweet potatoes.
J. econ. Ent., 1943, **36**: 552-4, bibl. 3.
Fumigation with paradichlorobenzene did not give complete control of sweet potato weevil (*Cylas formicarius elegantulus*) and retarded germination of the sets in U.S.A. A heavy methyl bromide fumigation (55 oz. per 1,000 cu. ft. for 5 hrs. at 70° F.) gave complete mortality and did not reduce shoot production (for cuttings) unduly and not at all when carefully selected seed stock was used.

860. LAI-YUNG LI. 633.85-1.531
The influence of stratification of tung-seeds upon emergence and establishment of seedlings in the nursery.
N.Z. J. Sci. Tech., 1943, **25**, Sec. A, pp. 43-8, bibl. 5.
Seedlings from stratified tung seeds began to appear above ground at the end of the 4th week after planting, and emergence became complete at the end of the 8th week, 75-95% having emerged at the end of the 7th week. Non-stratified seed started to emerge in the 7th week and completed emergence in the 11th week. The number of established seedlings was significantly higher after stratification, but seed treatment at 32° or 38° F. proved only slightly better than treatment at room temperature.

861. SHEAR, C. B., AND CRANE, H. L. 633.85: 581.142
Germination of the nuts of the tung tree as affected by penetrants, substrate, depth of planting and storage conditions.
Bot. Gaz., 1943, **105**: 251-6, bibl. 1.
Untreated tung nuts (*Aleurites fordii*) sown in February or March require 60 days at least for germination while many do not germinate till the following year. This delay is shown to be due to their slow rate of water absorption. Soaking the seeds (nuts) in 1% Morpholine for 48 hours attained the same percentage of germination 12-18 days prior to seeds soaked for the same period in water, and 16-30 days ahead of untreated seed. Tergetol at 0·1% concentration for 24 hours was very effective but toxic effects are possible which do not occur with Morpholine. Seed treated as above with Morpholine and planted in sphagnum reached the same percentage of emergence earlier than seed planted in rotted sawdust, in sphagnum and cinders mixed, in fresh sawdust and sand mixed or in sand alone. Sand gave the next best results with emergence only 7 days behind sphagnum. Complications arose in the evaluation of these results but the great value of sphagnum can be accepted. A planting depth of 1 inch gave quicker and higher germination than planting at 2 inches or at ½ inch. During storage, viability dropped after 2 months and seed stored at a refrigerated temperature of 7° C. proved less viable than that stored in a loft where the temperature varied with the weather from 7° C. to 55° C. or in a laboratory temperature varying from 23° C. to 32° C. The work was carried out at Beltsville, Maryland, by the U.S.A. Bureau of Plant Industry. At the time of the experiments the beneficial results of stratification had not been reported [for which see *H.A.*, 1942, 12: 1488].

862. WEBSTER, C. C. 633.85: 581.162.3
Observations and experiments on flowering and pollination of the tung tree.
E. Afr. agric. J., 1944, **9**: 136-43, bibl. 3.
The flowering habit and pollination of tung trees was studied for 3 years at the Tung Experimental Station, Nyasaland. The tree develops three types of flowering clusters: male, female and clusters containing flowers of both sexes. In a seedling plantation the population was found usually to consist of 40-50% predominantly male trees which bear only a little fruit, and of 50-60% so-called bearing trees with a large proportion of female flowers. Neither a gradual increase in female flowers on male trees nor an influence of soil and climate on flower distribution, as suggested by workers in Indo-China, could be observed in East Africa. Extensive records showed that in a budded plantation 5% of male trees will ensure satisfactory pollination, provided some of the male trees have an early flowering habit. The question whether the proportion of male trees can be reduced below 5% requires further investigation. Preliminary crossing and selfing experiments proved self-fertility to be fairly general in tung trees.

863. SMEE, C. 633.85
Cluster bug on tung (*Agonoscelis puberula*, Stal.).
Nyasaland agric. quart. J., 1943, **3**: 4: 25-6, bibl. 1.
The clusters of the plant bug *Agonoscelis puberula* on tung trees bodes no ill to the trees and may be disregarded as far as tung is concerned. The insect is a serious pest of millet in the Northern Sudan but during the clustering period, which may be a prolonged one, they are not feeding.

864. LINSLEY, E. G. 634.62-2.76
The date stone beetle (*Coccotrypes dactyliperda*) in California and Lower California.
J. econ. Ent., 1943, **36**: 804-5, bibl. 11.
A brief discussion of the probable incidence of the date stone beetle in California.

865. PREST, R. L. 634.653
The avocado.
Qd agric. J., 1943, **57**: 270-81.
Small avocado plantings, as a side line for Queensland growers, are advocated preparatory to large-scale commercial plantings, which are envisaged as a future development. So far, varieties imported from America and selections of locally raised seedlings have been grown successfully in the foothill districts along the North and South Coast and in Northern Queensland as well as, within certain limits, in the tropical and sub-tropical coastal areas. Its culture under Queensland conditions and a number of varieties are described in detail, with illustrations of the fruit.

TROPICAL CROPS.

866. JOYCE, F. DE V. 63(63)
Notes on agriculture in Ethiopia.
E. Afr. agric. J., 1943, **8**: 176-81, 227-30; **9**: 35-8.
A report on the agricultural problems of Ethiopia with special reference to the future, compiled from information obtained during a 5,000 miles tour of the country by the author in 1941. A high state of cultivation was found. Though anti-erosion methods are somewhat primitive there is visible evidence all over the country that the peasant is definitely alive to the problem and would respond favourably to further soil conservation measures on modern lines. A number of suggestions are made for the improvement of various crops, of marketing, transport and other amenities.

867. PECK, E. F. 63(677)
Agriculture in the Somaliland Protectorate.
E. Afr. agric. J., 1943, **9**: 42-6.
Opportunities of agricultural development exist but are hampered by lack of access to markets. Many Somalis would be glad to give up the hardships of their present nomadic life if suitable agricultural conditions could be provided, including a water supply that does not have to be transported on camels.

868. SNYDER, T. E., AND ZETEK, J. 674.048.4: 632.732
Effectiveness of wood preservatives in preventing attack by termites.
Circ. U.S. Dep. Agric. **683**, 1943, pp. 24, bibl. 13, 10 cents.
A discussion of materials, methods and results.

869. DALE, W. T. 632.8
Preliminary studies of the plant viruses of Trinidad.
Trop. Agriculture, Trin., 1943, **20**: 228-35, bibl. 27.
The viruses dealt with in detail are the cowpea mosaic, which has spread rapidly on the College farm and certain other areas in Trinidad, the common bean mosaic, and the tobacco mosaic, i.e. *Nicotiana* virus I. K.M.S. A list of other suspected plant viruses on which some work has been done in Trinidad is given. There is a brief review of literature and a note on the methods employed by the author.

870. MOREAU, R. E. 633.491: 551.566.1
The yield and maturity of potatoes, *Solanum tuberosum*, at low latitudes.
Emp. J. exp. Agric., 1944, **12**: 13-20, bibl. 29.
The author from an examination of the literature and from experimental evidence, much of it unpublished, concludes that the short days of the tropics are not the determining factor in the low yields of potatoes so frequently obtained there. Except when short days restrict vegetative growth below that needed to synthesize sufficient food for tuber storage they would seem to encourage more efficient tuberization than the long days. Contrary opinions usually held seem to be based on inconclusive or misinterpreted experiments.

871. CRANE, J. C. 633.523
Soft fiber from roselle.
Agric. Amer., 1944, **4**: 27-9, 32.
A description of roselle, *Hibiscus sabdariffa* (or Java jute), from which a soft jute-like fibre is obtained, and its cultivation. The plant flowers only in short-light days and is therefore best grown in tropical or subtropical climates.

872. LINCOLN, R. 633.526.29
L'industrie de l'aloës à Maurice. **(The aloes industry in Mauritius.)**
Rev. agric. Maurice, 1943, **22**: 174-84, bibl. 9.
The so-called aloe of Mauritius is not an aloe but *Furcraea gigantea*, a plant closely related to *Agave*. The leaves yield a hemp fibre which has some commercial value. The plant, introduced to the island from Brazil in 1750, is common, especially in waste places. Sporadic attempts have been made to cultivate it in regular plantations but little seems to have come of them until 1924, although cultivation is easy and cheap. In 1924 the Mauritius Hemp Producers' Syndicate was formed with the object of marketing a uniform product, to which end a central factory was established. This was followed by the Mauritius Spinning and Weaving Company founded in 1932 with the aid of a grant from the Colonial Development Fund to manufacture sacks from the local hemp. After a somewhat chequered history this Company is now in full operation, producing 3,000,000 bags between August 1941 and December 1943. The prime difficulties arise from the fact that only in a few cases is the plant cultivated and supplies have to be obtained from wild plants, mostly scattered and far from the factory. Suggestions are made as to the nutritional requirements of the plant based on analysis of the ash. A minimum yield of cultivated plants should be 575 kg. of dry fibre per arpent.* The local methods of preparing the fibre are also described.

873. EDWARDS, H. T. 633.526.1
Abacá—a new crop for Latin America.
Agric. Amer., 1944, **4**: 8-12.
An account of the successful cultivation of manila hemp in the Canal Zone of Panama. Before the war it was difficult to find a market in competition with already established Eastern sources. At the present time extensive plantings have been made and have been extended to Costa Rica, Guatemala and Honduras. The quality is fully equal to that of Philippine manila.

* 1 arpent = 1·04 acres.

874. CROIZAT, L. 633.682
Preliminari per uno studio del genere " manihot " nell'America meridionale. **(Preliminaries for the study of the genus *Manihot* in South America.)**
[English summary ½ p.]
Rev. argent. Agron., 1943, **10**: 213-26.
Seventeen species of *Manihot* are briefly reviewed, specimens of recent collection being cited under each. To these 17 binomials not less than 36 species or varieties are attached as new synonyms. The morphology of *Manihot* appears to be materially influenced by the ability of the root system to store food. The necessity is suggested of physiological studies as a preliminary toward a fuller understanding of the taxonomy of the genus. [From author's summary.]

875. FERNANDO, M., AND JAYASUNDERA, E. S. 633.682
Cultural experiments with cassava (*Manihot utilissima* Pohl) I.
Trop. Agriculturist, 1942, **98**: 3: 3-8.
In trials carried out at Anuradhapura Experiment Station, Ceylon, using 2 local selections of cassava A. 3·7 and B. 4·1, plants from 18-inch cuttings outyielded those from 6-inch cuttings; vertical planting gave increased yield over horizontal planting and a high percentage survival; there was no significant difference in yield between the 2 varieties or between the 2 spacings 3 ft.×3 ft. and 3 ft.×2 ft.; the thinning of tillers to one per plant did not affect the yield.

876. BOND, T. E. T. 633.72-2.8
The phloem necrosis virus disease of tea in Ceylon. I. Introductory account, symptoms and transmission by grafting.
Ann. appl. Biol., 1944, **31**: 40-6, bibl. 17.
An up-country virus disease of tea in Ceylon known as phloem necrosis from the characteristic internal symptoms has been under investigation since 1935 at the Tea Research Institute, Ceylon. External symptoms, consisting of leaf curl, zigzag and dwarfing of shoots, are of less common occurrence, being apparently influenced by climatic and growth conditions generally. Severely affected bushes may be entirely unproductive. The disease is transmissible by grafting and symptomless carriers capable of transmitting it have been discovered. It is most prevalent in the low jât or small leaved types, while the high jât or large leaved bushes appear mainly to be carriers. The theoretical aspects of the results are discussed, particularly the problem of interaction between environmental conditions and the nature of the host variety in determining the expression of symptoms. Affinity of the virus with the " yellows " group is surmised. Provisionally the virus can be referred to as *Camellia* virus I.

877. GADD, C. H. 633.72-2.6/7
An unusual correlation between insect damage and crop harvested.
Ann. appl. Biol., 1944, **31**: 47-51, bibl. 9.
At the Tea Research Institute, Ceylon, an experiment is described by which an attempt was made to determine the effect of manurial treatments on the damage caused by the shot-hole borer of tea [*Xyleborus fornicatus* subsp. *fornicatior*]. Increases in yields of the plots were accompanied by increases in the damage caused by the beetles as measured by the number of broken branches—an unusual correlation between pest damage and harvest ($r = +0{\cdot}9267$). The experiment failed to indicate clearly the cause of increased damage following manuring, but possibly it results from an increase in the number of galleries formed ($r = 0{\cdot}6547$). [Author's summary.]

878. THOMAS, A. S. 633.73
The wild coffees of Uganda.
Emp. J. exp. Agric., 1944, **12**: 1-12, bibl. 7.

An account is given of four species of coffee known to be truly wild in Uganda—*Coffea eugenioides*, *C. canephora*, *C. excelsa* and *C. spathicalyx* in this order of frequency of occurrence. *C. eugenioides* is tolerant of a wide range of soil conditions but intolerant of damp situations. It grows in all the larger forests, often near the edges. It does not flower or fruit very freely and the beans are small and not worth collecting. *C. eugenioides* growing in forest has an open habit with an average leaf measurement of $3\frac{1}{2} \times 1\frac{1}{2}$ in. Planted in the open it becomes a compact conical shrub with small, narrow leaves measuring about $2 \times \frac{1}{2}$ in. *C. canephora* is a very variable species, for which reason it bears an assortment of specific names which is apt to cause confusion. It is a source of "robusta" coffee. It requires a moister soil than *C. eugenioides*, dislikes very acid soil and is more abundant deeper within the forest than the preceding species. Having been locally cultivated for some hundreds of years it is difficult to determine the localities in which its presence is not due to human agency. Its principal habitat is the Kibale Forest where large crops are picked annually under licence. Owing to its predilection for damp and even marshy ground the root system has a wide horizontal spread, obtaining nourishment from the forest litter rather than from the soil itself. The average leaf size is 9×3 in. A type from the Itwara Forest growing on a soil markedly more acid (pH 4·5) than the wild coffee usually tolerates was collected but proved disappointing under cultivation. *C. excelsa* is found in four forest localities, the finest specimens being in Bwamba Forest. There are both large and small leaved types so different in foliage and even fruit that they might almost be regarded as being separate species. *C. excelsa* grows on a wide range of soils from alkaline grey clay to slightly acid brown sandy loam. Like *C. canephora* it is a typically West African species. *C. spathicalyx* is the most uncommon, being found only in the Bwamba and Zoka forests. It is a very distinct species, easily recognizable by the attenuated drip tip of the dark green leaves; the average leaf measurement is $4 \times 1\frac{1}{2}$ in. The flowers have a characteristic spathelike calyx and a corolla which resembles that of *C. arabica*. The root system consists of a strong tap root and few spreading laterals. The cotyledons of the seedlings are cordate and not orbicular as in other species. Important practical lessons are to be learned from the study of these wild coffees, among those mentioned being the need for shade, the restriction of surface cultivation to avoid root injury, the preference for neutral or alkaline soils and the importance of potassium to their well-being, especially on poor soils.

879. BRANGANTE, E. C. 633.73(63)
La coltura del caffee del Gimma. **(Coffee growing in Abyssinia.)**
Agric. colon., 1942, **36**: 1-8.

A note on coffee in the regions of Gimma, Caffa, Gomma and Ghera. Rainfall 1,600-1,700 mm., temperature occasionally dropping to 30-32° F. Coffee is grown at an altitude of 1,500-2,000 metres, mostly in valleys and not on upper slopes. There are two types of culture: in one the groves are set by natives with plants taken from the forest; in the other native groves occur as around Aggaro and Gimma. In both cases plants receive practically no care except the removal of weeds in young plantings. There is very little pruning and long branches result. Native trees used for shade are *Acacia*, *Ficus*, *Albizzia*, *Erythrina*, *Cordia*, *Cassia*. Local opinion is that coffee produces more without shade, but when shaded has less disease and better aroma. A thick growth of 5-6 plants to a metre without counting seedlings is normal. Trees often are 5-6 m. tall and 4-5 m. in circumference. Fruit is borne at branch extremities far from the trunk. Plants need pruning, breakage by wind is common and irregular production results. Little damage is done by insects and diseases. There are two types of coffee: Malo has a rather long bean, large leaves, foliage to tips of branches, young branches bronze in colour. These characteristics indicate resistance to unfavourable environment. The Gimma coffee is less uniform in character, leaves pendulous, large, soft, with seeds plump and short like those of Mysore. A third type found near Aggoro is of superior flavour and of the small seed Moka type. Flowering occurs with the first rains in January and February, maturity and harvest October. November, December and January in the dry season. During the growing season altitude, rainfall and temperature have considerable influence. For local use coffee is allowed to dry before harvest, otherwise it is dried on hard ground. It is inferior to coffee from Harar. Prior to the Italian occupation 50% of the production of Abyssinian coffee or 5,000 tons was from Gimma.

G.W.A.

880. "PLANTER." 633.73-2.186
Sunshine and coffee.
Mon. Bull. Coff. Bd Kenya, 1943, **8**: 107-8.

The theory is advanced that the exposure of coffee trees, which have dropped their leaves, to the tropical sun is the fundamental cause of the prevailing deterioration of trees. A cheap device of artificial shade made from papyrus material over the centre of each tree is advocated until shade trees have grown big enough to function. S. Gillet, of the Coffee Services, endorses the author's remark that the damage done by leaf-fall is great. He thinks, however, that it can be regarded as the primary cause of deterioration only in the higher altitudes. Spraying with bordeaux mixture provides, in his opinion, a better control of leaf fall than does shade.

881. COFFEE BOARD OF KENYA. 633.73: 658.8
Report of the Marketing Committee.
Mon. Bull. Coff. Bd Kenya, 1944, **9**: 3-12.

A report by the Marketing Committee of the Coffee Board of Kenya recommends the immediate establishment of a single marketing organization to operate on a pool basis on lines similar to the existing Coffee Control. The arguments on which the recommendation is based are set out, and suggestions are made as to finance, staffing and management. A minority report opposes the element of compulsion by legislation which is to be introduced and considers that the organization could be successfully run on voluntary lines.

882. MAYNE, W. W. 633.73-2.95
Coffee spraying economics.
Plant. Chron., 1944, **39**: 53-6, 75-80.

The benefit derived from spraying coffee in Southern India is evident from a comparison of the figures for cost of spraying with the estimated reduction in loss. The figures given are: cost of two applications per acre Rs. 19, increase in yield 1 cwt. Assuming the price of coffee to be Rs. 80 per cwt. there is a sufficient margin to allow of a further rise in cost before spraying becomes unprofitable. Scarcity of materials, however, demands economy and the following measures are suggested: (1) The preparation of adequate roads will permit the use of shorter hose lengths and increase the efficiency of spraying, thus reducing the volume per acre required. (2) Experiments in several districts tended to show that the strength of the post-monsoon spray can be safely reduced to a $1\frac{1}{2}$-$1\frac{1}{2}$-40 bordeaux mixture in any area and that a 1-1-40 mixture will still give reasonable results. Two applications of a 1-1-40 spray proved more efficient than one 2-2-40 application. (3) Well pruned trees with a more open structure will reduce the amount of spraying material required. (4) The use of weaker sprays makes accurate timing imperative. In this connexion points from *Bull. Mysore Coffee Experiment Station* 15 are quoted and some further recommendations are added. (5) In case a reduction in the spraying programme becomes necessary, the first post-monsoon spray on heavier bearing coffee

should be dropped and not resumed the following year. A hot weather spray on coffee bearing a light crop could be omitted with least damage.

883. (TEMPANY, H. A.) 633.74-2.3/4
Cocoa disease in West Africa.
Crown Colon., 1944, **14**: 248.

Some notes are given on the visit of Dr. Tempany, Agricultural Adviser to the Colonial Office, to the West African Colonies, with special reference to the complex diseases and pests of cacao of which the final manifestation is the destructive virus disease known as swollen shoot. At a conference at Tafo, Gold Coast, attended by scientific, agricultural and administrative officers from Nigeria and the Gold Coast, it was agreed to undertake a survey of the whole cocoa area to determine the exact incidence of the disease and an increased research into the disease complex and the possibilities of control. The organization to be set up is to be a West African undertaking and capable of incorporation later with a permanent research scheme. The team is to be expanded to include on the research side seven botanists, plant pathologists and agronomists, seven entomologists and a chemist.

884. THOROLD, C. A. 633.74-2.4
Witches' broom disease investigations. VII. Observations on direct control.
Trop. Agriculture, Trin., 1943, **20**: 239-41, bibl. 4.

No significant differences in the number of brooms was found in a plot experiment at Marper Estate, Trinidad, between the effect of removing witches' broom (*Marasmius perniciosus*) affected material from cacao every month and allowing it to remain on the tree. There was no consistent effect from adjacent infected and neglected properties on the incidence within the estate of pods affected with the disease. These observations are in agreement with the results from previous experiments where controlled areas of 25, 40 or 80 acres were surrounded by trees from which no brooms were removed.

885. (BAKER, R. E. D., AND CROWDY, S. H.) 633.74-2.4
Witches' broom disease of cacao (*Marasmius perniciosus*).
Trop. Agriculture, Trin., 1944, **21**: 21-2, bibl. 2.

An editorial summary of Baker and Crowdy's recently published studies on witches' broom disease of cacao, Parts 1 and 2 (*Memoirs* 7 and 8, *Department of Mycology and Bacteriology, Imperial College of Tropical Agriculture, Trinidad*, 3s. each). The course of the disease is described. There appears to be considerable tree to tree variation in susceptibility. It seems probable that this resistance is not physiological but is more likely to be due to some form of disease avoidance on the part of the vegetative buds of certain trees. A high positive correlation found between the number of flowers produced and the number of cushion brooms per tree per year suggests that in areas infested by the broom disease very freely flowering trees are unsuitable. No form of direct control has proved satisfactory. Spraying and dusting are uneconomic and modifications in agricultural practice are not at present feasible, even if they proved effective, which is by no means certain. Complete routine cutting out of all brooms twice a year should, if done in April and October, be as effective as more frequent removal. This prevents the intense sporophore production which occurs in October while brooms subsequently formed can safely be left till the following April. The brooms and diseased pods and shells can be left on the ground and as long as they are not piled in heaps will produce very few sporophores. Experiment has shown, however, that the disease is not really controlled by these methods, which if carried out thoroughly are expensive. The production of immune or highly resistant types seems to be the only hope. These already exist, though nothing is known about the mechanism of resistance.

886. SILVA, P. 633.74-2.6/7
Insect pests of cacao in the State of Bahia, Brazil.
Trop. Agriculture, Trin., 1944, **21**: 8-14, bibl. 20.

Comparisons are made between insect pest problems of cacao in Bahia, Trinidad and Grenada. The information is welcome since the insect problems of S. America are not well known to workers elsewhere. Suggestions are made for control under Bahia conditions.

887. MUTINELLI, A. 633.77
Miscelanea sobre el cultivo de la yerba mate. **(Notes on the cultivation of maté.)**
Publ. misc. Minist. Agric. B. Aires **53**, 1939, pp. 11.

Imperata brasiliensis (Yahapé), *Cynodon dactylon* (Bermuda grass) and *Axonopus compressus* (Jesuit grass) are three invasive weeds of maté and other plantations which cause considerable damage if not suppressed. This can usually be done by sowing among them some strong growing annual such as *Melinis minutiflora* and the velvet bean, a hybrid between the Florida bean, *Stizolobium deeringianum*, and the Lyons bean, *Stizolobium niveum*. These plants by their shade will quickly kill out the grasses. In addition the velvet bean is valuable as a forage crop, especially for pigs. If a high yield of seed is required the plants must be trained on supports such as shrubby undergrowth or the moisture of the soil will rot many of the beans. Transplanting losses in maté are often heavy. Experiments have shown that the usual age of transplants, namely 1 year, is too young. Older plants do much better, particularly if they are cut back to about 10 cm. above the collar and have their roots lightly trimmed. The root system of maté is very adaptable to soil conditions. Ploughing the soil between the plants in spring is very beneficial and equivalent to manuring. Deep-rooting cover crops should be chosen; fertilizer should be applied above the root system, which is usually shallow.

888. PATEL, C. B. 633.85: 581.192
Chemical investigation of seed oil of *Moringa concanensis*.
Curr. Sci., 1943, **12**: 272-3, bibl. 1.

The tree *Moringa concanensis* is abundant in Gujarat, India; its seeds contain 38% of oil, the characteristics of which are given.

889. (MARTIN, G. R.) 633.912 + 633.913
Competitive rubber plants: hevea's advantages.
Crown Colon., 1944, **14**: 89-90.

G. R. Martin, in a paper read before the Royal Society of Arts, surveyed sources of rubber supply which are useful in the present emergency, but are unlikely to rob Eastern plantations of pre-eminence. Provided a high degree of mechanization can be achieved, the Russian kok saghyz and the African *Landolphia*, particularly *L. thollonii*, have, in the author's opinion, the greatest claim to be regarded as possible competitors of *Hevea* in a free market. *Cryptostegia* and guayule are also named as rubber-yielding plants of some future prospects.

890. PACHECO HERRARTE, M. 633.912
Cultivo de la *Hevea brasiliensis*. **(Growing *Hevea* in Guatemala.)**
Rev. agric. Guatemala, 1943, **20**: 7-9, 19-27.

An account of hevea cultivation with special reference to its possible establishment in Guatemala.

891. RICHARDS, A. V. 634.431-1.541.11
Studies in propagation of sapodilla.
Trop. Agriculturist, 1943, **99**: 78-82, bibl. 2.

The sapodilla, *Achras zapota*, can be propagated vegetatively by layering, inarching, budding or grafting. Though layers and gootees have been known to develop into fruiting trees within 2 years of planting, only a limited number can be raised from each bearing tree. Budding or grafting allows

of rapid multiplication, the difficulty here being to find a quick-growing compatible stock. The stocks used are: (1) Seedling sapodilla; this is slow growing and seed is often not available in sufficient quantity to raise large numbers of stocks; it shows good compatibility. (2) *Bassia longifolia*, the mee tree. Seed is available in large quantities, grows rapidly, the seedlings being cleft grafted when 4 months old with 95% success. Year-old stocks are less successful. Stocks 8 to 9 months old can be successfully budded by the modified Forkert method. There has, however, been little success in budding and grafting on the mee in the wet zone at Peradeniya. A disadvantage of the mee stock is a form of delayed incompatibility, in which after 4 or 5 years the stock outgrows the scion and begins to throw out suckers, apparently causing the scion to decline and often to break at the bud union. Experiments to induce scion rooting on mee stocks grafted below ground level are in progress. (3) *Mimusops hexandra*, the palu. This is a slow-growing stock compared to mee, the seedlings not being fit for budding till 18 months old. It seems longer lived and more drought resistant than mee and does not overgrow the scion to any marked extent. In India *Mimusops kauki* is reputed to induce earlier bearing and a dwarfer habit than that of trees on their own roots.

892. Bhat, S. S. 634.441-1.541
Nursery practices of mango grafting.
Ind. Fmg, 1943, **4**: 254-6.

Defective preparation of the grafts in Baroda nurseries is mainly responsible for the early death of the majority of mango trees in the field. The practice is to tie the shoots and branches of a selected mango tree to seedlings raised in pots, slicing off part of the bark and wood and bringing the two surfaces into close contact. When union is complete or nearly so, the scion is cut from its mother tree. This method has little success because (1) the seedlings are raised in containers which are too small, (2) scion branch and root-stock often do not match in thickness and age, (3) a wrong tying technique is employed, (4) the rootstocks are not headed back in time, (5) the stumps at the union are not trimmed properly and (6) the scion material is not carefully selected. The following practice, which may take 2-3 years longer to raise a mango plantation, is suggested: Mango grafts with a number of shoots should be taken to 2-year-old seedlings grown *in situ* and suitable shoots should be grafted on the seedlings in the usual way. When the union is complete the mother graft should be detached and used to graft other seedlings in succession.

893. Sen, P. K. 634.441-1.55
The bearing problem of the mango and how to control it.
Ind. J. Hort., 1943, **1**: 48-71, bibl. 11.

The mango is a pronounced irregular bearer. The problem, which is complicated also by climatic vagaries, is associated with nitrogen depletion following heavy flowering as the result of which growth is inhibited. In order to produce blossom annually it is essential (1) to make the tree produce proper growth and (2) to induce a check in growth at the proper time to encourage fruit bud formation. This can be done in various ways which are described. An appendix gives some cultural instructions which, if followed, will at least reduce the tendency to alternate bearing. Briefly these are: (1) selection of varieties showing annual bearing tendencies, e.g. Dasheri and Fazli; (2) wide spacing 30 ft.-40 ft., with windbreaks on the side of the hot winds; (3) adequate but not excessive nitrogen supply; (4) regular ploughing of the orchard 3 times a year; (5) annual manuring in October, the amount to be based on the appearance of the trees. Trees failing to produce sufficient new shoots in summer should receive sulphate of ammonia (5 lb. for a 6-year-old and 10 lb. for a 15-year-old tree) in June before the rains; (6) irrigation soon after fruit set; (7) ringing the main branches of 3 in.-5 in. thickness in August, the ring to be $\frac{1}{8}$ in. wide and at once plastered with grafting wax or a cowdung soil mixture. Ringing is only done where rainfall is over 30 in. and there are no late rains.

894. Leley, V. K., Narayana, N., and Daji, J. A. 634.441: 581.14
Biochemical studies in the growth and ripening of the Alphonse mango.
Ind. J. agric. Sci., 1943, **13**: 291-9, bibl. 17.

The physiological changes occurring in the Alphonse mango during growth and ripening were investigated at the College of Agriculture, Poona. The life of the fruit, which is divided into 3 phases, is about 105 days, 90 days being required for maturing on the plant. During the period of (1) adolescence (first 60 days) fresh weight, dry matter, nitrogen, starch and non-reducing sugars increase continuously, while reducing sugars and acidity of peel and stone-kernel decrease. The rate of respiration also decreases. (2) The period of maturation (next 30 days) is biochemically characterized by the accumulation of starch. Respiration remains at a constant low value. At the end of this phase the fruit is removed from the tree. (3) The period of senescence lasts another 15 days. Starch and cell wall incrustations are hydrolyzed and the fruit becomes soft and juicy. The reducing sugars produced are synthesized into sucrose. As the reducing sugar content rises, respiratory activity shoots up and reaches the climacteric peak value. The process of ripening of the picked fruit, if kept in a warm place, is completed in 8 days. The ripe fruit remains in a good condition for a week or more.

895. Sen, P. K. 634.441-2.184
Black-tip disease of the mango.
Ind. J. agric. Sci., 1943, **13**: 300-33, bibl. 18.

Extensive surveys 5 miles round the city of Bhagalpur, Bihar, supported by experiments definitely confirmed the popularly-held belief that the black-tip disease of mangoes is caused by coal fumes from coal-burning brick kilns near the orchards. The symptoms of the disorder, to which the fruits are particularly susceptible during the stages of active development, are described. 700 yards was the maximum distance within which damage could be traced. Studies as to which of the combustion products is responsible for the injury are being continued and suggestions are made for a safer construction of kilns.

896. Sanders, F. R., and Robertson, J. K. 634.651-1.56
Cultivation of papaw and production of papain.
E. Afr. agric. J., 1944, **9**: 173-4.

The production of papain has recently been taken up in Tanganyika, chiefly in the Northern Province. The cultivation, tapping and processing of papaw and the packing of the processed product are described.

897. Wallace, G. B. 634.651-2.4
Diseases of papaws.
E. Afr. agric. J., 1944, **9**: 175-6, bibl. 3.

Root, stem and fruit rot of papaws, caused by *Pythium* or *Phytophthora*, as well as mildew and a few other fruit rots are described with their control measures.

898. Briant, A. K., and Tidbury, G. E. 634.774: 664.85.774.036.5
Numerical estimation of pineapples suitable for canning.
E. Afr. agric. J., 1944, **9**: 154-5, bibl. 2.

The author summarizing results of experiments at Kizimbani Experiment Station, Zanzibar, writes as follows:—"A graph is described from which the percentage of pineapples less than any critical weight may be read if the mean weight of the sample is known. This simple method of estimating in any given sample the number of pineapples unsuitable for slice-canning is considered to be of use commercially and in assessing the value of experimental treatments."

899. Sideris, C. P., Young, H. Y., and Krauss, B. H. 634.774-1.811.9
Effects of iron on the growth and ash constituents of *Ananas comosus* (L) Merr.
Plant Physiol., 1943, **18**: 608-32, bibl. 26.
Changes in H-ion concentrations which constantly develop on the surface of the roots or at the regions of the rhizosphere of pineapples during the absorption of ions from nutrient solution cultures supplied either with nitrate or with ammonium salts as sources for nitrogen may facilitate or inhibit the absorption of iron by the roots. The paper is from the Pineapple Experiment Station, Hawaii.

900. Fernando, M. 635.1/7
Spacing experiments with vegetables.
Trop. Agriculturist, 1943, **99**: 69-77.
Spacing trials with certain vegetables were carried out at the Matale and Tabbowa Vegetable Seed Stations, Ceylon, to provide data for use in a projected programme of vegetable selection and the opportunity was taken to compare certain varieties for yield. The following spacings are recommended as giving the best results. 1. Cucumber (*Cucumis sativus*) 4 ft.×1 ft. This was the closest spacing used and by far the most productive. Variety: the Botanist's selected strain of indigenous cucumber. 2. Luffa (*Luffa acutangula*) 6 ft.×4 ft. Variety: the Botanist's selected strain of ribbed luffa. 3. Bandakka (*Hibiscus esculentus*) 3 ft.×3 ft. The Botanist's single plant selection, H.10, was compared with the variety NWD. No significant differences were found. 4. Brinjal (*Solanum melongena*) 3 ft.×4 ft. Varieties compared were (*a*) Matale Wilt-resistant and (*b*) Valuthalai, a strain obtained from the Experiment Station, Anurhapura. Wilt caused 16 casualties in Matale Wilt-resistant and 107 in Valuthalai. The Matale strain yielded 5 times that of Valuthalai, which was handicapped by its susceptibility to wilt. 5. Cowpea (*Vigna unguiculata*) 4 ft.×2 ft. The variety V.4, a single plant selection of polon-mé with a low half-bushy habit significantly outyielded the other selections, Trinidad and CD.

901. Patel, B. S., and Patel, K. R. 635.627
Tondali cultivation in Poona.
Ind. Fmg, 1943, **4**: 239-42.
Instructions on the cultivation of tondali (*Coccinia cordifolia*) in Poona with special reference to climate and soil requirements, manuring, irrigation and care, marketing and pests and diseases.

902. Rodrigo, A. del P. 635.648
Hibiscus esculentus cultivado en la Argentina. (***Hibiscus esculentus* grown in Argentina.**)
Rev. argent. Agron., 1943, **10**: 235-8.
Some danger of confusion between the edible *Hibiscus esculentus* (okra) and *H. manihot* seems possible in Argentina. An illustrated key is here given of the two species by which their differences are made apparent.

903. Jayaweera, D. M. A. 633.88.51
History of cinchona culture in Ceylon.
Trop. Agriculturist, 1943, **99**: 91-5.
Hansford, C. G. 632.4(676.1)
Host list of the parasitic fungi of Uganda. Parts I, II and III.
E. Afr. agric. J., 1943, **8**: 248-52; **9**: 50-5, 102-6.
Callan, E. McC. 633.74-2.73-2.96
Natural enemies of the cacao thrips.
Bull. ent. Res., 1943, **34**: 313-21, bibl. 28.
Chiarelli, A. 633.77-2.78
Un geométrido perjudicial a la yerba mate, "*Thyrinteina arnobia*". (**A geometrid pest of maté.**)
Rev. argent. Agron., 1943, **10**: 250-5.

STORAGE.*

904. Gescher, N. von. 664.8
The conservation of food products and its different aspects.
Int. Rev. Agric. Rome (*Mon. Bull. agric. Sci. Pract.*), 1942, **33**: 286T-304T.
A collection of data on food preservation obtained as a result of experimental work in different countries.

905. Anon. 664.85.11.037
Orienterande lagringsförsök med äpple 1942-1943. (**Preliminary storage trials with apples 1942-1943.**)
Meddel. Statens Trädgårdsförs. **20**, from summary *Fruktodlaren*, 1943, Nr. 6, p. 184.
Swedish storage trials with the apple varieties Cox's Orange Pippin, Cox's Pomona, Gravenstein and Filippa confirmed previous results that a storage temperature of 1½ to 2½° C. delays the development of the fruit. Filippa proved particularly suitable for cold storage. Loss of weight was markedly higher in Cox's Orange than in Filippa. This difference may be due to a difference of the wax covers of the two fruits. The loss of weight of Cox's Orange varied with different rootstocks. It was lowest in fruit from trees on E.M. IX and highest from those on E.M. XVI. Wrapping the fruits in tissue paper reduced loss of weight with Filippa, but had no effect on Gravenstein. The oxidation of ascorbic acid was checked at the low temperatures. Rotting through moulds occurred in all varieties tested; spotting was confined to the large-sized fruits of Gravenstein.

906. Southwick, F. W., and Smock, R. M. 664.85.11.035.1
Lengthening the storage life of apples by removal of volatile materials from the storage atmosphere.
Plant Physiol., 1943, **18**: 716-7.
In experiments carried out at Cornell University brominated charcoal was the only air conditioning agent that gave perfect control of scald on McIntosh apples. A secondary result was the addition of 2 or 3 months to the storage life of the fruit (apart from scald control). For reasons which are given it is suggested that esters are not the causative agent of scald but that scald is in some way related to an unsaturated hydrocarbon. The experiments were made in a year when volatile production was not high, thus such favourable results may not always be achieved, particularly with a very scald-susceptible variety such as Rhode Island Greening.

907. Esbjerg, N. 664.85.11.035.1 +664.85.13.035.1
Storage trials with apples and pears in carbon-dioxide chambers and other storerooms. [Danish.]
Tidsskr. Planteavl, 1942, **46**: 426-93, and 1 p. English summary, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 102.
Tabulated results show that of the apple varieties tested Nonnetit, Filippa, Gravenstein, Bramley's Seedling and Beauty of Kent were best suited to gas storage.

908. Kaess, G. 664.85.11.035.1 +664.85.13.035.1
Die Gaskaltlagerung von Obst. I. Mitteilung: Versuche mit der Apfelsorte Goldrenette von Blenheim. (**Gas storage of fruit. I. The Blenheim orange apple.**)
Gartenbauwiss., 1943, **17**: 591-602, bibl. 11.
A special technical equipment for the automatic control of the gas atmosphere in a cold storage plant is described. [For findings on varietal response to gas storage see Abstract 459.]

909. Pastoriza, R. 664.85.25.037 +664.85.22.037
Tres años de ensayos de conservación frigorifica de duraznos y ciruelas. (**Three years of experiments in cold storage of peaches and plums.**)
Bol. Frut. Hort. B. Aires, 1942, Vol. **6**, No. 48, pp. 58, bibl. 7.
The bulletin gives a large number of results obtained in

* See also 459.

various experiments in cold storage with different kinds of peaches and plums in the Argentina.

910. Rakitin, J. V. 547.313.2: 634.1/8-1.547.6
A practical guide to the artificial ripening of fruit.
[Russian.]
Published by the Academy of Science, U.S.S.R., Moscow and Leningrad, 1942, pp. 92.

As soon as the seed has become ripe, the fleshy pericarp, especially the portion in the immediate vicinity of the seeds, begins to undergo those changes which are associated with the ripening of fruit, the conversion of starch to sugars and of insoluble to soluble pectins. Before describing the practical procedure of artificial ripening by means of ethylene the author considers the biological influences which this gas exerts in the fruit, and describes some experiments which enabled him to prove that sufficient ethylene is produced by fruit to make their ripening possible. He was able to preserve the ethylene, which apples and other fruit gave off during successive stages of ripening, and determine the actual quantities of it by comparing the effects which it exerted at each stage upon vetch seedlings with those of a series of chemically prepared samples of ethylene of known concentration. The length of the seedlings was measured and when their growth was found to be retarded by a particular sample of gas produced by the fruit to an amount equal to that of a standard sample of ethylene, the concentration of ethylene in the former was presumed to be equal to that in the standard. Having, furthermore, used the same quantities of ethylene which he had determined as described, in order to ripen fruit, the author was able to conclude that the quantities actually produced by the fruit are sufficient to bring about ripening. Ethylene exerts this effect not directly but by its effect on the enzymes. According to Oparin the enzymes occur in two forms: in solution, and in combination with protoplasm; in the one they act hydrolytically and therefore cause ripening, in the other synthetically. Ethylene, by its presence or absence, is able to determine which action shall be paramount. Ethylene should, therefore, be artificially applied before the fruit begins to produce it for itself, and removed as soon as it starts to produce for itself. The author devotes part of a section to describing a method which he and Alexeenko devised for making ethylene. The process begins with ethyl alcohol and is brought about by means of a certain clay which acts as a catalyst. From one litre of alcohol 300 l. of ethylene can be produced at a temperature of 550° C. One thousand litres can be produced in 8 hours, a quantity sufficient to ripen 25 to 125 tons of fruit. It is claimed that the method is simple, the equipment portable, and can be operated by one man. A detailed description is given of a ripening house, and its management. Though it must not leak, it need not be absolutely gas-tight. An account is also given of measuring and controlling humidity, stacking the fruit and letting in the gas. To obtain a concentration of 1: 100 per cubic metre 1 litre of gas is required; for 1: 2,500, 0·4 l.; and for 1: 5,000, 0·2 l. These amounts of gas correspond to 100, 40 and 20 litres per 100 cubic metres. All fruits require the same technique, though not identical conditions. According to the particular fruit, the concentration of gas may be between 1: 5,000 and 1: 1,000, the weight of fruit to be treated 40 to 100 kg. per cubic metre, and the temperature between 18° and 23° C. The relative humidity required by most fruits is about 85%. The author considers the treatment of several fruits in turn, among them being apples, pears, plums, citrus fruits, and pineapples. It has been objected that the ethylene treatment of citrus fruits does not always increase the sugar content. The author points out that, unlike many other fruits, they have no starch to be converted to sugars as ripening proceeds; they contain cellulose, and sugars cease to be accumulated at a certain stage. If the fruits are picked before this stage has been reached, artificial ripening will not increase the sugar content, for it does not affect cellulose, yet should they be picked at this stage, it will be found that, as a result of artificial ripening they are equal in quality to naturally-ripened fruit.

911. Tindale, G. B. 664.85
Fruit quality in the shops.
J. Dep. Agric. Vict., 1943, **41**: 581-3.

The installation in shops selling fruit and vegetables of a cool chamber with two compartments is suggested. The temperatures should be automatically controlled at 65° F. for ripening and at 40° F. for cold storage. The total annual overhead and operating cost is estimated to amount to £125.

912. Edholm, H. 664.84
Nyare erfarenheter om lagring av vegetabilier. **(Recent experiences in the storage of vegetables including potatoes.)**
Sverig. pomol. Fören. Årsskr., 1943, **44**: 113-38.

The paper, read to the Swedish Pomological Association in March 1943, describes in detail the equipment and construction of modern store houses for vegetables and potatoes. Eighteen technical diagrams and photographs are helpful.

913. Platenius, H. 664.84.035.1
Effect of oxygen concentration on the respiration of some vegetables.
Plant Physiol., 1943, **18**: 671-84, bibl. 9.

The critical oxygen concentration below which the tissue of stored vegetables was injured [at Cornell University] by anaerobic respiration (2·3% of oxygen representing the extinction point of NR or the concentration at which the type of respiration occurring in pure nitrogen becomes extinct) was about 1% for spinach and snap beans, 2·5% for asparagus and 4% for peas and carrots when held for several days at 20° C. At the most effective oxygen level the respiration rate as measured by CO_2 production could be reduced to about 50% of the rate in normal air. At the most effective oxygen levels asparagus retained 8 times and peas 2½ times as much sugar as comparable samples in normal air. Asparagus proteins furnish about one-third of the substrate of respiration.

914. Reinhold, J., and others. 664.84
Versuche zur Besserung der Haltbarkeit von Gemüse in Mieten. **(Storage trials with vegetables in clamps.)**
Forschungsdienst, 1942, *Sonderh.* **16**, pp. 452-8, from abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 151.

A study of the best clamping methods for carrots, celeriac and cabbage, carried out in different parts of Germany, did not produce uniform results, but some points of general validity emerged: (1) An intermediate layer of sand proved beneficial, (2) covering carrots and celeriac with sand was in most cases found superior to covering with soil or straw, (3) a 2-3 cm. layer of glass fibre mats was shown to be equal to the usually employed 30 cm. layer of bulky organic materials, (4) celeriac overwintered best in pits, (5) there was no difference in result between storing cabbage in clamps or just covering, (6) losses were smaller in clamps with both bottom and top ventilation than in clamps with bottom ventilation only, as usually employed by growers. Further, an account is given of a short-term rotting method of determining in advance the probable storage life of vegetables to be clamped.

915. Heinze, P. H., and Appleman, C. O. 633.492-1.56: 664.84.22
A biochemical study of the curing processes in sweet potatoes.
Plant Physiol., 1943, **18**: 548-55, bibl. 7.

Sweet potatoes to store well for any length of time must be subjected immediately after digging to a suitable combination of temperature and humidity. The physiology of curing is

imperfectly understood owing to ignorance of the essential chemical changes in the roots during curing. The experiments carried out at the Maryland Experiment Station on Maryland Golden Potatoes were concerned with the nitrogen metabolism and pectic transformation under different conditions of temperature and humidity. A curing temperature of 86° F. with a high relative humidity gave the best results with subsequent storage at 50°-53° F. During curing (11 days) soluble pectin increased while protopectin decreased, the position being reversed during storage. During curing protein hydrolysis was indicated by increase of non-protein nitrogen and decrease of protein nitrogen. There were increases in basic, amide and residual nitrogen, with a consistent increase in amino nitrogen only in lots cured at high temperatures, 95° and 104° F. At the end of the storage period of 4 months basic amide and residual nitrogens again increased slightly. Nitrogen distribution during storage remained fairly stable. No one outstanding essential change was observed during curing.

916. Tindale, G. B., Doery, A., and Wilson, Y. 664.84.13
Carrot storage experiments.
J. Dep. Agric. Vict., 1944, **42**: 71-2, 74.
Excellent carrots of the Chantenay variety were grown in 2 districts in Victoria and stored in clamps and cool stores. At one place pitting was a complete failure, at the other the limit of storage life was reached after 7 weeks, when the carrots began to sprout in September, and a loss of 10% in weight was noted. Storage life in the second case might have been longer had the carrots been put in the pits in early winter. Cool storage tests, on the other hand, showed that carrots dug in winter keep in excellent condition for 3-4 months if held at 32° F., losses being 3-5%. From a survey of cool stores in the country the necessity of providing for vertical spaces to allow for air currents emerged as a further point. So far, it has been impossible to establish any benefit from gas storage.

917. Powell, A. A. 664.84.25
Storage of onions.
N.Z. J. Agric., 1943, **67**: 321-4, and 1944, **68**: 7.
Owing to war conditions greater quantities of onions will have to be stored by New Zealand growers in the coming season. Attention is drawn to the most important factors for successful storage.

918. Lutscher, A. M. 634.63-1.56
Preparacion y conservacion de aceitunas. **(Preservation and storage of olives.)**
Bol. Fom. rur. B. Aires, 1942, **7**: 74: 23-5.
Denny, F. E. 664.84.21: 577.15.04
The use of methyl ester of α-naphthaleneacetic acid for inhibiting sprouting of potato tubers, and an estimate of the amount of chemical retained by tubers.
Contr. Boyce Thompson Inst., 1942, **12**: 387-403, bibl. 4.
Denny, F. E., and Thornton, N. C. 664.84.21
The third year's results on storage of potato tubers in relation to sugar content and color of potato chips.
Contr. Boyce Thompson Inst., 1942, **12**: 405-29, bibl. 11.

PROCESSING AND PLANT PRODUCTS.

919. Hall, E. G. 634.2/7: 612.3
The nutritive value of Australian tropical fruits.
Agric. Gaz. N.S.W., 1943, **54**: 568-9, bibl. 9.
The nutritive value of Australian tropical fruits is discussed and data on their composition are tabulated. The following fruits are dealt with: Apricot, avocado, banana, banana passion fruit, custard apple, feijoa, guava, jujube, jack fruit, mango, orange, passion fruit, pawpaw, pineapple, persimmon (Japanese).

920. (Kawereau, E., and Fearon, W. R.) 577.16
Thiourea as protective agent for vitamin C.
Nature, 1944, **153**: 384-5.
The protection of vitamin C in food products during industrial processing is briefly discussed. Reference is made to the investigations of E. Kawereau and W. R. Fearon (*Sci. Proc. roy. Dublin Soc.*, 1944, 23: 171) who have found that thiourea protects ascorbic acid from oxidation in the presence of copper. Boiled vegetable extracts had a similar stabilizing effect on the vitamin. The presence of a volatile thiol compound in cabbage and of an active distillate on boiling in potato juice was demonstrated.

921. Pepkowitz, L. P. 581.192: 577.16
The rapid determination of ascorbic acid by the adaptation of Stotz's method to plant materials.
J. biol. Chem., 1943, **151**: 405-12, bibl. 8.
An adaptation of Stotz's method for ascorbic acid in blood and urine is described for the rapid determination of ascorbic acid in plant materials. The method depends upon selective solubility in xylene of non-reduced 2,6-dichlorophenol indophenol from acid solutions. Two procedures are presented to correct for extraneous xylene-soluble pigments contained in certain plant extracts. The method is applicable to all plant material tried, whether fresh, frozen, or dehydrated. Because of its simplicity, the procedure is particularly suitable for routine analyses, for 60 to 70 determinations can be made during a working day. The method is especially useful for highly colored or turbid extracts. [Author's summary.]

922. Gross, E. 634.11: 577.16
Vitamin C-Untersuchungen an Äpfeln. **(Vitamin C investigations in apples.)**
Gartenbauwiss., 1943, **17**: 500-4, bibl. 14.
With only minor exceptions, the vitamin C content of 12 apple varieties tested at Eisgrub, Germany, decreased from the skin to the core. The average percentage determined in the different layers was: skin (layer I) 67·6, II 16·7, III 7·2, IV 4·5, V 4·0. The pulp contained 43·5-86% of the total vitamin C and the skin 14-56·5%.

923. Möckel, W., Wolf, J., and Degen, U. 634.11: 577.16
Ascorbinsäure- und Vitamin C-Gehalt deutscher Apfelsorten. **(Ascorbic acid- and vitamin C-content of German apple varieties.)**
Gartenbauwiss., 1942, **17**: 176-85, bibl. 7, from abstract *Schweiz. Z. Obst-u. Weinb.*, 1943, **52**: 96.
A total of 80 German apple varieties were tested shortly after picking for their ascorbic acid content and of these 48 were tested for vitamin C. The investigations, which were carried out at Wiesloch, led to a confirmation of earlier results.* The average ascorbic acid content of the 80 varieties under test was found to be 13·4 mg. in 100 g. apple (including peel), the vitamin C content of the 48 varieties amounting to 17·8 mg. The higher ascorbic acid and vitamin C content was not strictly confined to the more valuable varieties. All varieties of any economic importance in Germany can be regarded as a valuable source of vitamin C.

924. Scupin, L. 577.16: 634.11+635.34
Vitamin C-Untersuchungen an Äpfeln und Weisskohl. **(Investigations on vitamin C in apples and white cabbage.)**
Vorratspfl. u. Lebensmittelforsch., **4**: 1-17, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 30-1.
The retention of vitamin C in apples under various storage conditions was studied at Leipzig. It was found to depend

* See *H.A.*, 12: 784.

largely on the temperature of storage. Vitamin content was lower at higher temperatures (+1 to +12·5° C. in a cellar from December to June) than in cool storage (—0·5 to —1° C. at a relative moisture of 85-88%), where an increase could be determined. In storage trials with white cabbage temperature did not have such a clear influence. Losses during storage were about 20-30%, but in April the vitamin C content was still relatively high. There were considerable differences between individual cabbages.

925. ROTH, H. 577.16
Die Bestimmung des Vitamins B_2 (Lactoflavin) in Pflanzen. **(The determination of vitamin B_2 in plants.)**
Vorratspfl. u. Lebensmittelforsch., 1941, **4**: 34-43, from abstract *Gartenbauwiss.*, 1942, Vol. **17**, abstr. p. 30.
A method for the determination of lactoflavin and lactoflavin phosphoric acid is described, which will give accurate results when a constant loss of 33·3% has been considered. Of the plants tested spinach, lettuce, grass and clover proved the richest sources of vitamin B_2.

926. LELESZ, E. 581.192: 577.16
The problem of increase in vitamin content of agricultural products in view of improving the diet of the people.
Int. Rev. Agric. Rome (*Mon. Bull. agric. Sci. Pract.*), 1942, **33**: 265T-85T, bibl. 36.

MCINTOSH, J. 635.1/7: 577.16
The effect of preparation for freezing, freezing and storage and cooking on the vitamin content of vegetables.
Fruit Prod. J., 1944, **23**: 143-5, 149, bibl. 16.
A summary of present information.

927. SWABY, R. J. 634.1/8-1.56
Extraction of citrates and tartrates from fruits.
Agric. Gaz. N.S.W., 1943, **54**: 571-3, 580, bibl. 16.
An investigation into the possibility of replacing pre-war imports into Australia of citric and tartaric acids for fruit preservation purposes and other industries by home-produced extracts. Analyses of lemons, grapes and tamarind pods of various origins showed, however, that Australian fruits contain rather less acids than overseas specimens. The analytical data are tabulated.

928. CURL, A. L., AND NELSON, E. K. 634.71: 581.192
The occurrence of citric and isocitric acid in blackberries and in dewberry hybrids.
J. agric. Res., 1943, **67**: 301-3, bibl. 11.
The non-volatile acids present in three blackberries, Brainerd, Crandall, and Texas Wonder, and in two trailing hybrids, the Boysen and the Young, have been investigated by the ester distillation method. The predominating acid in the three blackberries was found to be isocitric acid, whereas in the Boysen and Young dewberries it is citric acid. [Authors' summary.]

929. KIDD, F. 664.8.047
Preservation of foods by drying.
Nature, 1944, **153**: 100-2.
The recent progress in food dehydration is briefly reviewed. With vegetables the pre-drying heat treatment for the destruction of enzymes is important. There are striking reductions in weight and bulk, e.g. 25 lb. fresh cabbage reduces to 1 lb. of dry material. This when placed in boiling water will swell up and be completely cooked in 20 minutes. The difficulties in potato drying centre round the fact that the starch grains are so gelatinized in the pre-drying heat treatment that, if the cellulose wall enclosing them is broken, sticky consistency is produced on reconstitution with water. Feeding experiments with 400 men resulted in less dehydrated cabbage being left on their plates than was the case when fresh cabbage was used and the vitamin intake with dried cabbage was the higher. The compressed block pack of dehydrated vegetables has made some progress but is only generally used in the case of meat. It effects great saving in volume in dried vegetables which pack loosely.

930. DE SORIANO, A. M. 664.85.047(82)
Inspección de frutas secas y desecadas del comercio. **(Inspection of commercial dried fruit [in Argentina].)** [English summary 18 lines.]
Rev. argent. Agron., 1943, **10**: 385-95.
The results are discussed of the inspection of 125 samples of desiccated fruits, including walnuts, figs, peaches, apricots, pears, prunes, apples and nectarines. Only 36% of the samples would have proved of the recognized commercial standard required by U.S.A. Those packed in cellophane were in worse condition than those obtained loose. There is no doubt that the standard could be greatly improved. The trouble is largely due to insect infestation.

931. CALDWELL, J. S., CULPEPPER, C. W., AND SCOTT, D. H. 664.85.25.047
Varietal suitability for dehydration in eastern freestone peaches.
Fruit Prod. J., 1943, **23**: 68-71, 89, 101-6, 136-42, 151, bibl. 24.
Fruit was tested of 62 varieties of freestone peaches all grown together in the orchards of the Plant Industry Station, Beltsville, Md. The method of drying is described and the results arranged in 5 grades according to quality. Unpeeled samples were usually graded lower than those of corresponding peeled samples. The 4 varieties in the top grade were Lovell, Gold Drop, Valiant, and Veteran.

932. SIMMONS, P. 664.85.047: 632.7
Preventing insect damage in home-dried fruits.
Leafl. U.S. Dep. Agric. **235**, 1943, pp. 4.
Notes are given on the use of high temperature, cold storage, fumigation and satisfactory containers.

933. CRUESS, W. V., SMITH, M., AND BALOG, E. G. 664.84.21.047
Enzyme reactions in dehydrated potatoes.
Fruit Prod. J., 1944, **23**: 135, 155.
The enzymic darkening of freshly peeled potatoes during dehydration is easily prevented by dipping the peeled potatoes for a moment in 0·3 to 1·0% sodium bisulphite or other SO_2-containing solution. The process is preferable to blanching by heating. It is not necessary, as is at present supposed, to obtain a negative peroxidase reaction in order that dehydrated potatoes should keep well, provided they have been blanched sufficiently to prevent discoloration during dehydration. Since blanching by heating barely sufficient to destroy catalase only (160° F.) did not prevent discoloration, it appears that the catalase test may not be very useful for dehydrated potatoes.

934. ALLEN, R. J. L., BARKER, J., AND MAPSON, L. W. 664.84.34.047
The drying of vegetables. I. Cabbage.
J. Soc. chem. Ind. Lond., 1943, **62**: 145-60, bibl. 83.
The production of dried cabbage of high culinary quality and nutritive value was studied for 3 years at the University of Cambridge, both at the Low Temperature Station for Research in Biochemistry and Biophysics and the Dunn Nutritional Laboratory, as part of the programme of the Food Investigation Board. In the course of the investigation the ascorbic acid was determined in 110 batches of cabbages of 14 varieties. Those harvested in spring were found to contain most vitamin C. The cabbage was shredded, scalded for 2-3 minutes in a 0·22% $Na_2SO_3.7H_2O$ solution and dried on trays, over which a current of hot air was circulated. For preservation of colour a pH value of the liquor 7·3-7·5 after scalding should be aimed at, and carbonate should be added if necessary. The best method of retaining ascorbic acid was serial scalding, i.e. using the

same liquor for scalding successive lots of cabbage. The addition of 0·5-10% sodium chloride to the scalding water also reduced leaching losses during short scalds. Scalding vessels of copper or iron should be avoided. The ascorbic acid content of scalded cabbage was 94% of the fresh, but the loss of vitamin B_1 was high. Practically no loss occurred of β-carotene. It was found that the drying air could have an initial temperature of 95° C., 60-65° being the highest temperature at which it is safe to finish drying. Drying should not be extended beyond 7 hours. Vitamin C lost in the whole process amounted to not more than 22%, and colour, flavour and texture were fully preserved in the dried product. The resulting savings in weight and space are given as 95% and 88% respectively. In an addendum by E. M. Cruickshank a comparison is made of chemical and biological assay of vitamin C in cabbage dried in the presence of sulphite.

935. Cruess, W. V., Friar, H., and Balog, E. 664.84.34.047

Notes on cabbage dehydration.

Fruit Prod. J., 1943, **23**: 113-5.

Notes are given on observations made during experiments with 3 commercial dehydrators on sulphiting of cabbage. Considerably stronger solutions were required for sulphiting cabbage before than after blanching. Sulphited cabbage could be finished at a much higher temperature (160° F.) than unsulphited cabbage, spraying or dipping being equally effective methods of sulphiting. Dried cabbage containing initially 2,180-2,500 p.p.m. SO_2 retained its flavour, odour and colour more or less unimpaired after 4 months' storage at room temperature, whereas cabbage containing less than 1,800 p.p.m. had become stale. Bisulphite may be more effective than sulphite or a 50: 50 mixture of sulphite and bisulphite in preventing staling of flavour and odour of dried cabbage in storage.

936. Dutton, H. J., Bailey, G. F., and Kohake, E. 664.84.41.047

Dehydrated spinach. Changes in color and pigments during processing and storage.

Industr. Engng Chem. (*Industrial Edition*), 1943, **35**: 1173-7, bibl. 14.

Carotene in contrast to chlorophyll is stable under the blanching conditions used and is protected by blanching against loss in the subsequent dehydration process. Although a nutritional function for chlorophyll has never been demonstrated, it is labile in nature; and in the storage of unblanched spinach its conversion to pheophytin indicates a probable deterioration in palatability and in ascorbic acid content, even though it does not necessarily indicate a loss in carotene.

937. Kessler, H., and others. 664.85 + 664.84

Tagung über Kälteanwendung in der Obst- u. Gemüseverwertung. **(Conference on the application of cold in the processing of fruits and vegetables.)**

Schweiz. Z. Obst-u. Weinb., 1943, **52**: 548-64, 575-80, 583-92.

(1) Kessler, H. 664.85.037 + 664.84.037

Die Bedeutung der Sortenwahl bei der Herstellung von Gefrierkonserven aus Obst und Gemüse. **(The significance of selecting suitable varieties of fruit and vegetables for frozen pack preservation,** pp. 548-64.

The freezing of fruits and vegetables for canning is a very young industry in Switzerland, but it is largely based on American and Continental experience. The problem of selecting the most suitable varieties under Swiss conditions remained, however, to be solved. Variety testing on a big scale was, therefore, undertaken at Wädenswil covering 82 vegetable and 68 fruit varieties in 1942 and 63 and 120 varieties respectively in 1943. Fuller details are given for peas, beans, cherries and strawberries.

(2) Widmer, A. 663.813

Ueber die Herstellung von sog. "Halbkonzentrat" aus Fruchtsäften nach dem Gefrierverfahren und dessen Verwendung bei Früchtegefrierkonserven als Ersatz von Rohrzucker bzw. Rohrzuckerlösung. **(On the production of a so-called "half-concentrate" from fruit juices by the freezing method and its application in the canning of frozen fruits as a substitute for cane sugar or cane sugar solution),** pp. 575-80.

The preliminary experiments refer to a half-concentrate from cherry juice with a sugar content of 30%.

(3) Geiger, A. 577.16: 664.85 + 664.84

Das Verhalten der Vitamine beim Konservieren und Lagern von Früchten und Gemüsen. **(The retention of vitamins in preserved and stored fruits and vegetables),** pp. 583-9.

Tests showed that frozen fruits and vegetables are not inferior to tinned products in respect of vitamin retention.

(4) Kessler, H. 664.85 + 664.84

Hinweis auf einige wichtige Fragen aus dem Gebiet der Frischaufbewahrung von Obst und Gemüse. **(Some important problems in the storage of fresh fruit and vegetables),** pp. 589-92.

On the strength of previous results a new air-cooled cellar for storing fruit and vegetables was constructed at Wädenswil. The cold air, which is introduced above the cellar floor by lateral feeding channels, streams vertically through the stored products, which rest on wooden grids, and after being warmed up leaves the cellar through wooden chimneys. In order to maintain a low temperature as uniform as possible the building, including the chimneys, must be well insulated. Moreover, the shutting devices have to be opened when the temperature outside is lower than inside. This system provides optimum aeration, whereas the temperature depends largely on the weather. Storage trials with cabbage, however, gave similar results for cellars and cold storage. This stresses the importance of the aeration factor, which again is connected with the right manner of packing. The method of vertical aeration is to be tested also for fruit and potatoes.

938. List, G. M. 664.84.64.036.5

The effects of sulfur residue on keeping qualities of canned tomato products.

J. econ. Ent., 1943, **36**: 694-700, bibl. 12.

Two treatments with sulphur dust or with lime-sulphur with wettable sulphur added for tomato psyllid (*Paratrioza cockerelli*) control even after harvest had begun did not present a sulphur residue problem of any importance to the canner, provided the usual care was taken in washing the fruit.

939. Garoglio, P. G. 663.25

Trattato di enologia. Enciclopedia vitivinicola moderna in cinque volumi. Vol. 4: Il progresso vinicolo ed olearo. **(A modern treatise on wine making in five volumes. Vol. 4. Oenological progress.)**

Int. Rev. Agric. Rome (*Mon. Bull. agric. Sci. Pract.*), 1942, **33**: 385T.

The 4th volume of the encyclopedia is divided into 2 parts, dealing with the disorders of wines and the rational working of wine and with the by-products of the vine respectively.

940. Hopkins, R. H. 663.4

Wartime brewing problems in Great Britain.

Commun. Wallerstein Labs., 1943, **6**: 153-9.

Scarcity of labour, both skilled and unskilled, is the most serious problem of the wartime brewer in Great Britain.

Hardly less important are the technological difficulties which have arisen as the result of the war and it is with these that the present article deals. They are connected with the supply of raw materials, with beer barrelage and strength, with brewer's yeast and yeast weakness which the tendency in recent decades to use barley of very low nitrogen content has aggravated, with the use of flaked barley and oats as part of the grist, with the scarcity of hops and their antiseptic properties, with the scarcity of sugar and isinglass, with scarcity of fuel, with enforced lack of research on processing, with distribution problems. The brewer's attempts to cope with his increasing difficulties are clearly described.

941. Atkins, C. D., Moore, E. L., and Heid, J. L. 663.813: 634.322
Tangerine juice products.
Fruit Prod. J., 1944, **23**: 132-4, 152-3, 157, bibl. 7, being *Agric. chem. Res. Div. Contr. (U.S.A.)* **126**.
Experimental work on the preparation of tangerine juice products is described. Bland syrups were more promising than canned juice; the latter soon developing off-flavours. The syrups retaining 49-79% of the original ascorbic acid content of the juice were prepared by boiling juice with calcium carbonate, filtering, adjusting the pH to 5·2 with citric acid, treating with decolourizing carbon and concentrating under vacuum. The equipment required is discussed. The manufacture of these juice products should prove a commercial success if combined with recovery of flavouring oil and cattle feed.

942. Downer, A. W. E. 663.813: 634.3
The preservation of citrus juices with sulphurous acid.
J. Soc. chem. Ind. Lond., 1943, **62**: 124-7, bibl. 10.
Routine fermentation tests on a large number of samples showed the incidence of infections among citrus juice concentrates to be much higher than among natural citrus juices. It is suggested that the lower resistance of concentrates is due to their lower content of free sulphurous acid. Natural orange and grapefruit juices are kept in a sound condition with 800-1,000 p.p.m. of total sulphurous acid with a free sulphurous acid content of approximately 500 p.p.m. To be safe, 4-fold concentrated orange and grapefruit juices should therefore contain 2,000-2,500 p.p.m. of total sulphurous acid.

943. (Love, H. T.) 634.653: 633.85
Avocado oil.
Trop. Agriculture, Trin., 1944, **21**: 7, from *A.R. Puerto Rico Exp. Stat. 1942* [sic].
The value of avocado oil, which could be abundantly produced in the tropics, appears to have been overlooked commercially. The oil has a high content of A, D and E vitamins and a high digestibility coefficient and should prove a good cooking oil. After the extraction of oil and water the other constituents are 5 to 8 times more concentrated in the remaining cake than in the unprocessed fruit and the cake should prove a valuable stock feed. An account is given of a process of extracting the oil, using as little as 0·5% of lime, slaked or unslaked. The lime mixed with the pulp released the oil, which, after the pulp had set by standing, was expressed by a hydraulic filter press, extracted with organic solvents by mechanical mixing or obtained by floating off with water. The oil was a clear golden yellow which could be bleached to clear water-white by prolonged heating at 100° C. or exposure to sunlight, the latter treatment inducing a rancidity difficult to remove by the usual caustic process. Vitamin A was probably entirely destroyed by bleaching. Extraction of lime-treated pulp with petroleum ether or ethyl ether in a mechanical mixer gave a clear green oil, the colour intensity being influenced by the solvent used and the length of time the lime-treated pulp was left standing before extraction. If the pulp is to be used as cake the initial concentration of lime added to the pulp must be kept low, since 0·5 lime added to the pulp becomes 4 or 5% in the pressed cake.

944. Todd, A. R. 633.522: 633.88
The hemp drugs.
Endeavour, 1943, **2**: 69-72.
Recent progress towards the solution of the chemical nature of the intoxicating principle of hashish, derived from hemp (*Cannabis sativa*), is described.

945. Castro, R. 664.85.047
Desecacion de frutas. **(Fruit drying in Argentina.)**
Bol. Frut. Hort. B. Aires, 1942, Vol. 7, No. 82, pp. 70, 3rd edit.

Argentina, Ministry of Agriculture. 664.85 + 664.85
Industrializacion casera de frutas y hortalizas. **(Home preservation of fruit and vegetables.)**
Bol. Frut. Hort. B. Aires, 1942, Vol. 7, No. 52, pp. 72.

Schieferdecker, H., and others. 664.84.047 + 664.85.047
Das Trocknen von Gemüse und Obst sowie die Herstellung von Trockenspeisekartoffeln. **(The drying of vegetables and fruit and the preparation of dried potatoes for human consumption.)**
Serger & Hempel, Brunswick, 1942, pp. 140, 2nd edit., RM. 4. From abstract *Gartenbauwiss.*, 1943, Vol. **17**, abstr. p. 102.

Western Research Laboratory, Albany, California. 663.2: 631.57
Recovery of tartrates from grape wastes.
Fruit Prod. J., 1943, **23**: 107-12, bibl. 1.

Böhringer, P. 634.8: 581.192
Über die Bestimmung des Refraktometerwertes von Pfälzer Trauben mittels des Zeiss'chen Handrefraktometers. **(The determination of the refractometer value of grapes from the Palatinate by means of the Zeiss hand refractometer.)**
Gartenbauwiss., 1943, **17**: 505-20, bibl. 13.

Young, J. R., and Jeffrey, R. N. 633.71-1.56
Changes in certain water-soluble nitrogenous constituents of Burley tobacco during curing.
Plant Physiol., 1943, **18**: 433-48, bibl. 15.

NOTES ON BOOKS AND REPORTS.

946. Webber, H. J., and Batchelor, L. D. 634.3
The citrus industry. Vol. I. History, botany and breeding.
University of California Press, Berkeley and Los Angeles, 1943, pp. 1028, bibl. pp. 58, $7.50, price in England 45s.
This volume, the first of a projected trilogy, is intended, the preface announces, to bring together a somewhat extended summary of the most important information available on the history and botany of the citrus industry, including discussions on climatology, geography, species, varieties, anatomy, physiology, nutrition, embryology, genetics and breeding and covering in general the life history of citrus plants, especially in relation to commercial production. Volumes II and III, yet to come, will be entitled respectively "The production of the crop" and "The harvesting, marketing and utilization of the crop". Actually the present treatise is a symposium, a number of workers of renown in citrus research contributing chapters bearing on the subjects of which they have made a particular study. Such well known names as Swingle, Shamel, Bartholemew and Reed, Frost and Chapman and Kelley are sufficient

guarantee that the ground has been well and truly covered. The senior editor, H. J. Webber, is responsible for four of the ten chapters, his subjects being the history of the industry, climatology and geography and related matters. The bibliography is very extensive, covering 58 pages and containing between 1,100 and 1,200 references, besides many others incorporated in the text. Of considerable importance is the monograph on *Citrus* species by W. T. Swingle entitled " The botany of *Citrus* and its wild relatives of the orange sub-family " since here for the first time for many years is presented a connected account of the whole orange sub-family, supplemented by remarks on the geographical distribution and probable evolutionary history of the 33 genera treated and on the possible economic characters of such species as possess them. Cultivated varieties of citrus are described by Webber, who has confined himself to some 215 of the most important and interesting varieties grown in the United States. Notes on origin are given; all modern commercial varieties are of fairly recent date and though descended from the old types described by the early writers, doubtless differ from them genetically. Bartholemew and Reed give a sufficiently full account of citrus morphology, histology and physiology. The chapter on nutrition is contributed by Chapman and Kelley and is concerned with the mineral composition of citrus and its plant food requirements, special emphasis being laid on the effects of deficiencies and excesses, with a brief note on soil reaction. More intimate physiological reactions such as the influence of one ion of absorption on another, translocation and mobility of nutrients within the plant and kindred topics, of which positive knowledge is scant, are not discussed. H. B. Frost deals with seed reproduction, chiefly by way of a description of the reproductive parts and processes, and in a second chapter summarizes and interprets the available evidence on heredity, applying what knowledge is available to the problems of the production of improved horticultural varieties. The concluding chapter on bud variation and bud selection is by A. D. Shamel, than whom there is no greater authority.

947. BAWDEN, F. C. 632.8
Plant viruses and virus diseases.
Chronica Botanica Co., Waltham, Massachusetts (2nd edition), 1943, pp. 294, bibliographies, $4.75.

" This ", as the author states in his preface to the first edition (1939), " is not meant to be a textbook of virus diseases " and consequently, as an examination of the subject-index and the two chapters on Symptomatology confirms, it cannot be expected to function as a diagnostic handbook for practising plant pathologists. Mr. Bawden is here primarily concerned rather with his own particular research approach, the study of the viruses *qua* viruses, preponderantly of those infective isolates from virus-diseased plants the properties of which can be studied *in vitro*, and the bulk of the book is concerned with reviewing in impressive detail the considerable recent contributions of scientific workers in fields other than that of plant pathology, namely " chemists, crystallographers, entomologists, geneticists, serologists, physicists and others ", and as such provides an invaluable compendium of information for the research virologist.

A brief synopsis of chapters will sufficiently indicate the scope of the work. I. An Introductory Survey is followed by a general account of Symptomatology, both external and internal (II and III). IV is a survey of methods of Transmission, and V Relationship between Viruses and their Insect Vectors, enlarged in the present edition to include recent work on this subject of important application to the analysis of virus complexes. VI, Virus Strains, Mutations and Acquired Immunity, is of considerable relevance to the problem of economic control. The next seven chapters (120 pp.) deal with studies of virus isolates *in vitro*, namely VII, Serological Reaction of Plant Viruses; VIII, Methods of Purification; IX, Properties of Purified Virus Preparations; X, Optical Properties of Purified Virus Preparations; XI, Inactivation of Viruses; and XII, The Sizes of Virus Particles. This section is followed by a chapter XIII on the Physiology of Virus-Diseased Plants. The work concludes with XIV, The Classification of Viruses, XV, The Control of Virus Diseases and finally XVI, Discussion on the Origin and Multiplication of Viruses.

The picture thus presented of " these intriguing pathogens " is necessarily incomplete, for, unlike such pathogens as fungi and bacteria, a complete concept of any virus as an entity cannot yet be disentangled from its obligate living plant environment. Thus, whilst Mr. Bawden in his preface to the present edition states that " most workers are agreed that tobacco mosaic virus is a nucleo protein ", it will be appreciated that this conclusion is based on the study *in vitro* of an infective isolate from mosaic tobacco plants which, although able to reproduce the disease on re-inoculation, has proved to be quite inert outside its living host. True, as Mr. Bawden suggests, a castrated dog is still a dog and possibly a living dog, but with the lack of even one virus culturable outside its host it is extremely problematic, under existing visual limitations, just how closely and in what respects the isolated " virus " approximates to the total virus existing and multiplying within the living plant cells. In this connexion Mr. Bawden in his new preface and in his closing chapter stresses the present lack of knowledge of " the behaviour of viruses in their natural environment within the host plant ", i.e. *in vivo*, and predicts that the next major advances in the subject will concern this important aspect. R.V.H.

948. BUSH, R. 634.7
Soft fruit growing.
Penguin Books Ltd., Harmondsworth, Middlesex (Penguin Special **S119**), 1942, pp. 173, 1s. 6d.

This most readable little book aspires to guide the amateur in the growing of soft fruits and certainly deserves success. The subject is dealt with methodically, the general questions of aspect, soil, nursery material and planting procedure all being reviewed prior to a discussion of the specific cultural details associated with the various soft fruits. The range of soft fruits covered is large, for with the commonly grown blackberries, loganberries, currants, gooseberries, raspberries, strawberries and tomatoes are included the less familiar figs, outdoor grapes, mulberries, cranberries, barberries, melons and passion fruit. Whether a nut is a soft fruit or not seems open to debate, but a chapter on the various kinds is provided and, moreover, contains a competent account of the pruning of cobs, a subject of which most horticultural manuals fight shy. Whole chapters are devoted to the vagaries of frosts, the construction and use of the compost heap to the practical exclusion of chemical manures, and the need for and practice of spraying. Naturally in a book of this description, that attempts to give advice on so many aspects of a very wide subject, recommendations sometimes go beyond what has been proved by experiment; this, however, is not a serious fault, as the author's practical experience enables him to suggest a treatment which seems to work, even if it is not quite the best that might be possible. There are, however, some points on which we consider he has gone somewhat astray. He recommends wheat or oat straw in preference to barley straw for strawing strawberries, whereas in practice barley straw is preferred because it is softer and easier to draw round the plants. Again he states that no blackberry comes true from seed, whereas there are indications that Merton Early can be so reproduced with a marked degree of uniformity.* In his description of reversion of black currants he states that bees, aphis, capsid and the pruning knife in addition to the big bud mite carry the virus, although the mite is the only agent so far proved to do so, and he suggests, contrary to research findings, that manuring and pruning can assist in avoiding the disease. His recommendation of a fine

* See Abstract 960.

spray for some purposes and a coarse drench for others is rather out of date, since moderately fine driving sprays are used for all purposes nowadays. The booklet is well illustrated with line drawings, that do, on the whole, clearly demonstrate what is intended. The planting plans on pages 25, 26 and 27, however, are not too easy to understand.

H.B.S.M.

949. BUSH, R. 634.11
634.13+634.14+634.2
Tree fruit growing. Vol. I. Apples. Vol. II. Pears, quinces and stone fruits.
Penguin Books Ltd., Harmondsworth, Middlesex (Penguin Specials **S132** and **S138**), 1943, pp. 167 and 158, 1s. 6d. each.

These two volumes present to the amateur, in most attractive form, an up-to-date and accurate account of how to grow fruit. Naturally in the rather restricted space available many details have had to be omitted, but all the essentials are included and it is doubtful if a better book on the subject has ever been produced at the price. Volume I deals with apples and describes the points to watch in choosing suitable soils, rootstocks and varieties. It gives working instructions, well illustrated with line drawings, for budding and grafting trees in the nursery. In simple language the life processes of an apple tree are outlined and the bearing of this on fruit production is explained. The whole of the John Innes Leaflet No. 4, entitled "Fertility Rules", giving valuable information on the mixtures of varieties necessary for good pollination, is inserted as a chapter. Other chapters are devoted to detailed information on planting, manuring, pruning, pests and diseases and spraying. It will be somewhat disconcerting to paper economists to find tables dealing with pollination of pears, plums and cherries in a book entitled apples (chapter V) and to find spray schedules for pears, stone fruit and soft fruit also included, especially as they are again reproduced in Vol. II. The various fruits are each accorded a chapter on cultivation followed by another on their pests and diseases.

Vol. II carries on with pears, medlars, quinces and the stone fruits. The chapters on pollination (XIV) and on spraying (XV) are reproduced from Vol. I without any alteration. Almonds are discussed in a short chapter that is bound to interest many who hitherto have only grown almonds for the beauty of their flowers, for an attempt is made to indicate the distinguishing features of varieties that are safe to eat. Advice is given on laying out a field to fruit trees and here Mr. Bush seems to be catering for the commercial grower rather than for the amateur, for whom the book is presumably intended. Chapters on the use of bees and hand pollination, on some useful tools, and a comprehensive annotated list of works on relevant subjects complete the book. Both volumes I and II are well illustrated with line drawings and photographs, amazingly well reproduced considering the price, and the whole is leavened with a lively wit and numerous anecdotes which would make the books pleasant fireside reading even for the landless. Although intended for amateurs, these books can be highly recommended to fruit growers of all sorts, to students and to research workers, because even when Mr. Bush veers from fact to fancy he does "make you think" and some of his wild ideas and guesses may eventually be found not to have been so wild after all.

H.B.S.M.

950. WILLIS, L. G. 631.81.03: 016
Bibliography of references to the literature on the minor elements and their relation to plant and animal nutrition.
Third Edition and supplements 1-4, Chilean Nitrate Educational Bureau Inc., 120 Broadway, N. York, 1939, pp. 488; 1940, pp. 82; 1941, pp. 67; 1942, pp. 78; 1943, pp. 92.

The annotated references are grouped under individual elements and are indexed under element, plant and author in the supplements and under element and author* in the index itself. They are taken in the main from (American) *Chemical Abstracts* and *Experiment Station Record.*

951. ANAND. 633/635
The first and second Annual Reports of the Governing Body of the Institute of Agriculture, Animal Husbandry and Dairying, Anand, Bombay, for the period ending 31st March, 1941, 1942 ***and 31st March, 1942,*** 1943, pp. 36 and 29.

The 1st report contains the history of the establishment of this Institute, which consists of two agricultural farms, one newly acquired at Anand, the other already in being at Chharodi. Provision is to be made for some 50 students. There will be a Horticultural Section. Mango and banana are important fruit crops of the district and these will receive special attention, as also will the vegetative propagation by grafting of improved varieties of cheki (*Achras zapota*, the sapodilla).

The 2nd report announces considerable progress. All the planned buildings have been erected, various experiments have been laid out and 58 students were admitted (out of 84 applicants) of whom 39 remained at the end of the year, those who withdrew finding themselves unsuited to the work. An account is given of the experiments in progress. A statement of accounts is contained in an appendix.

952. CANADIAN HORTICULTURAL COUNCIL. 634/635(71)
Proceedings and Reports of the 20th Annual Meeting, Ottawa, Feb. 24/26, 1942, pp. 75.

This contains the resolutions adopted by the Council at the meeting and the reports presented by the different committees on progress in horticultural research throughout the Dominion in 1941. The information in its condensed abstract form concerns a great number of research projects and forms a concise account of activities at individual centres.

953. CANADIAN HORTICULTURAL COUNCIL. 634/635(71)
Report of the Committee on Horticultural Research 1943, pp. 69 (mimeographed).

A valuable and comprehensive account in highly condensed form of the chief investigations and some of the results recently achieved by horticultural workers in all parts of Canada. More than half of it is concerned with straightforward horticulture including the processing of its products, 8 pages are devoted to entomological work and 24 pages to pathological investigations. Briefly it may be useful to note that work is reported on the following subjects—among others—at the places named:—breeding and selection of fruits, vegetables and ornamentals at nearly every station; fruit tree rootstocks at Ottawa, Kentville, Vineland, Charlottetown; vegetable seed foundation stocks at most of the stations and colleges; processing at Ottawa, Summerland, University of B.C. and Guelph; storage at Ottawa and Summerland; greenhouse at Ottawa and Guelph; ornamentals at many, including Ottawa, Brooks Alberta, University of Saskatchewan, Charlottetown (dahlias), Saanichton (bulbs); nutrition, including deficiencies, at Ottawa, Ste. Clothilde, Saanichton, Summerland, Fredericton, Vineland; cover cropping at Vineland, Summerland; spraying to produce parthenocarpy at Kentville, successful in petunia, potato and tomato but not in apple; apple juice packing at Macdonald College; kok saghyz cultivation at Kentville; oil crops cultivation at Brooks Alberta; colchicine treatment of vegetables and ornamentals at Ottawa, University of Alberta, Edmonton; successful sand culture of vegetables on bench area of an acre in Labrador.

954. CAWTHRON INSTITUTE. 633/635
Annual Report of the Cawthron Institute, Nelson, N.Z., for 1942, 1943, pp. 32.

Investigations in progress of interest to horticulturists are

* Names of all authors are indexed in the 4th supplement; in others only those of the first-named authors.

many. *Fruit.* Methods have been determined for colorimetric tests of magnesium and potassium in the ash skeleton of apple leaves. Clear colour differentiations based on the amounts of Mg and K present have been obtained by the use of titan yellow for Mg and sodium cobaltinitrite reagent for K. The tests have, further, proved useful for diagnosis of actual deficiencies of these elements in fruit trees. Trials show the value of ground dolomite, magnesium carbonate and magnesium sulphate in treating Mg deficiency, the first giving the most consistent, though less quickly noticeable results. On the Jonathan apple manurial plots at Upper Moutere the block from which K has been omitted for the last 10 years shows increasing deterioration. Growth on the plot treated with ammonium sulphate only is worse than that on the wholly untreated plot. The necessity for phosphate on this type of poor soil has been proved. Rejuvenation has been accomplished in certain trees previously left untreated by the application of a complete fertilizer. Apple rootstock experiments in which Double Vigour and seedlings are being compared with Northern Spy and East Malling stocks clearly show the characteristic growth made on the more vigorous stocks. Trials are in progress on the propagation of *Ephialtes candatus*, the codling moth parasite. *Tomatoes.* This includes investigations into steam sterilization of soil, cloud, hard core, vitamin C content and varieties suitable for canning. Vitamin C varied between varieties according to amount of sunlight received by individual fruits. *Tobacco.* The intake of plant nutrients by tobacco was determined by chemical analysis of leaf samples. It is now found possible to extract more than 90% of the nicotine present in waste leaf. The causes and prevention of mosaic are being investigated. The search continues for a collar rot (*Sclerotinia*) control in seedlings. *Entomological Investigations.* Work is in progress on the biological control of gorse by the seed weevil, *Apion ulicis*, of piri-piri by the sawfly *Antholcus varinervis*, and of codling moth by *Ascogaster quadridentatus* and *Ephialtes candatus*. The incidence of tomato eelworm is being investigated. *D.S.I.R. Division of Entomology.* The larval parasite *Angitia cerophaga* and the pupal parasite, *Diadromus collaris* of the diamond-back moth *Plutella maculipennis* continue to exercise considerable control over this pest. Similarly *Pieris rapae* has been successfully checked by *Pteromalus puparum*, while liberation of the larval parasite *Apanteles glomeratus* is being planned for the same purpose. Attention is being paid to moths infesting stored tobacco and to the possible damage done by certain mites and insects to flax.

955. CEYLON. 633/635
Administrative Report of the Acting Director of Agriculture for 1942, Part IV, Education, Science and Art D, 1943, pp. 16, 35 cents.

Tea. Phloem necrosis has been established by grafting to be a virus disease. Manurial experiments confirmed earlier conclusions (1) that tea shows directly proportional responses to increasing applications of nitrogen, even up to 80 lb. N per acre; (2) that manure applied at the time of pruning is comparatively ineffective. *Coconut.* The paramount importance of potash in the nutrition of the mature tree was again shown in manurial experiments. The biological control of the coconut caterpillar, *Nephantis serinopa*, will require the continuous intensive liberation of the parasite through at least two wet seasons and the intervening dry period. *Cassava.* The fungus disease, *Fomes lignosus*, was recorded for the first time in Ceylon as a root disease of cassava. In rubber clearings this crop may be used as an indicator of the presence of infected roots and stumps. *Cucurbits.* A sap-transmissible virus disease was discovered on pumpkin (*Curcurbita pepo*) and snake gourd (*Trichosanthes anguina*). *Tomato.* A virus disease causing leaf curl and stunted growth was not transmissible by sap but was so-by grafting and by the agency of white fly. *Citrus.* A new disorder causing stunting and staghorn, with branching gum canals in the cambium region was studied. Stock/scion experiments show rough lemon to be a satisfactory stock for grapefruit of all varieties, sweet orange, mandarin, and Tahiti lime, sour orange to give variable results with grapefruit, to be a total failure with Tahiti lime and to impart vigour to Vavuniya orange and Nagpur santra mandarin. Patharan and pummelo were unsuitable stocks for Tahiti lime. Mango trials with 4 local stocks have so far shown no significant results of stock effect on shooting. *Citronella.* Complete fertilizer doubled the yield without affecting the quality of the oil. P and K were more important than N. The optimum time of cutting was at 3 or 4 months according to locality. *Cardamom.* To improve neglected plantations good shade, manuring with compost and cleaning of the plants are essential. A mixture of bone meal, groundnut cake and muriate of potash is a suitable substitute for compost. *Cinchona.* Determinations of alkaloids from young plants of *C. ledgeriana, C. succirubra* and the hybrid *ledgeriana* × *succirubra* showed the content of total alkaloid in the stem of the 2-year-old plants to be double that of the 1-year-olds, while the yield of bark is 4 times as much. The figure for stem bark is 3% while root bark contains about twice the proportion of alkaloids. In stem bark of *C. ledgeriana* about 40% of the total alkaloids is extractable as quinine sulphate.

956. CEYLON, TEA RESEARCH INSTITUTE. 633.72
Annual Report of the Tea Research Institute for 1942, 1943, being *Bull.* 24, pp. 55.

An unusual infection of tea bushes by brown root disease, *Fomes noxius*, by way of the roots of a pollarded *Grevillea* is recorded. Infection from the roots of felled *Grevillea* is common, but in this case the tree was pollarded 8 ft. from the ground, so that apparently in the space of 3 years the infecting fungus grew through the wood for that additional distance to reach the tea roots. The grafting technique is described by which phloem necrosis was demonstrated to be a virus disease. Apparent jat differences in susceptibility to the disease are discussed. These results and certain other experiments have made the differentiation of various false necroses from phloem necrosis considerably easier. In experiments still in progress the roguing of necrotic or suspected bushes has been effective in checking the disease. Entomological work has largely concentrated on the study of *Saissetia coffeae*, the brown scale, as a possible vector of phloem necrosis. So far transmission via the insect has not been effected. Studies continue on the anatomy of the tea plant in relation to the eventual precise characterization of phloem necrosis. The interim results of manurial experiments are quoted, full discussion of the results being deferred till the completion of the pruning cycle. Eighteen months after the start of a plucking experiment plots plucked consistently to the fish leaf, though looking jaded and with a rapidly diminishing flush, have yielded more than twice that of plots plucked normally, i.e. to the foliage leaf above the fish leaf.

957. CEYLON, RUBBER RESEARCH BOARD. 633.912
Report of the work of the Rubber Research Board in 1942, 1943, pp. 44.

Reports are made on various new clones. In a series of stock trials the best growth of buddings was found on the most vigorous stocks, an exception being the vigorous B.S.3 which makes a poor stock. An examination of stock/scion relationships in high budded trees showed that the scions had no effect on yield of stocks when tapped 16-20 inches below the union. Twinning of seedlings by the Ramaer method resulted in an average loss of growth of 1·1 inches of circumference at the end of 2 years. An experiment set up to compare the Ramaer and Gambar methods (both described) showed that while twinning always resulted in a loss of growth, a difference between the effectiveness of the two methods could not be demonstrated. A clonal museum has been set up on the Kepitigalla estate by arrangement with the proprietors, the principal aim being

to compare the susceptibility of different clones to *Oidium* leaf disease. In tapping experiments the double three system exceeds in yield by 28·5% that of the control tapped s/2, d/2 (2×6 m/12) 100% in the fifth year and by 18·9% for the mean yield over 5 years. Scraping the tapping panel below the cut with and without an application of vegetable oil led to an immediate increase of yield of 80-100%, which fell to 50% by the third tapping and to normal by the end of the fourth month. Some undesirable cracking and flaking of the bark resulted. In experiments still continuing a light grooming was found to give more satisfactory results than a heavier scraping. In manurial trials with young rubber there is an indication of a general response to phosphate and a smaller response to nitrogen. The report also contains much of interest concerning technical research on latex, rubber hydrocarbon improvement and other matters outside the scope of this Bureau.

958. HILLSBOROUGH. 633.52-2.4
16th Annual Report of the Agricultural Research Institute of Northern Ireland, Hillsborough, 1942/3, 1943, pp. 30.

Items of horticultural interest in the Hillsborough report, which incidentally contains a plan of the farm, are notes on investigations into rates of flax seeding and into stem break and browning disease (*Polyspora lini*) and seedling blight (*Colletotrichum lini*). Seed treatment with Ceresan U.564 in its original and modified form and with certain organo-mercurial dusts gave a high measure of control of both diseases.

959. HORTICULTURAL SOCIETY OF INDIA. 634/635
The Indian Journal of Horticulture, 1943, Vol. 1, No. 1, pp. 87, single nos. Rs. 6/8 post free, annual subscription Rs. 12 in India, Rs. 13 abroad, from Treasurer, P.O. Kodur, Madras.

The Horticultural Society of India have issued the first number of a new publication which is to serve as its official publication. The Indian Journal of Horticulture will be issued twice yearly in June and December. This first number is largely devoted to discussing ways and means for the improvement of horticulture in India. There are, however, several more scientific articles, not the least interesting being that on the double cropping of apples in Bangalore by H. C. Javaraya, describing a unique method of horticulture by which the tree is induced to fruit twice within 12 to 15 months. The new journal will certainly fill a gap in horticultural literature and we wish it every success.

960. JOHN INNES. 634/635
Thirty-fourth Annual Report of the John Innes Horticultural Institution, 1943, 1944, pp. 26.

Pomology Department. A description is given of the six stages in the raising of a new variety from the original cross to its introduction to commerce. It is noted that the blackberry, Merton Thornless, has now reached the last (6th) stage and has been introduced. Two cherries, Merton Bigarreau and Merton Heart, have reached stage 5 as also one seedling apple, Merton Russet (Sturmer Pippin×Cox's Orange Pippin). Indications that Merton Early blackberry can be raised true from seed are being tested. The inheritance of the following characters in tomato is being studied:—resistance to leaf mould, resistance to cold and dwarf and bush habit. The main factor in ripening green tomatoes is found to be not light but heat, the optimum temperature being 22° C. Work on the induction of polyploids continues. The difficulty of producing polyploid seedlings in apples and pears has been overcome. The method adopted (that of Dr. Thomas) is to soak undried embryos in an 0·05% solution of colchicine. The embryos are kept in the light at a temperature of 25° C. The seedlings begin to germinate in 24-48 hours according to time of year. General rules for the successful treatment of seeds with colchicine are given here. Work is also in progress on the possibility of inducing bud sports in established fruit varieties by chemical treatment. Experiments on heterochromatin and differentiation in growth rate indicate that the primary cause of variation in growth rate and size in apple rootstocks and varieties is due to differences in the regulating action of heterochromatin. Differences are found to occur in the heterochromatin content of a number of apple rootstocks and varieties, but at present their significance is not clear. Work is in progress on pollen tube growth in relation to pollen size and its connexion with incompatibility in fruit trees. The incidence of natural crossing in tomato varieties grown side by side in the open is being examined. An adaptor has been devised to fit a vacuum cleaner for large-scale collection and distribution of pollen. The device appears likely to be commercially useful.

Genetics Department. Experiments are reported on the relation of natural crossing to distance, flowering mass and flowering time in radishes, beet, barley and turnips.

Garden Department. Tests show that the John Innes composts possess a marked degree of homogeneity, and by growing plants in these composts soil heterogeneity is practically eliminated. A series of experiments has been begun to throw light on the best methods of raising seedlings. Early trials show that there is far less check to young tomato and lettuce plants if they are pricked out as soon as the cotyledons have unfolded than if the operation is delayed for 3-7 days. Potting on in midwinter from seed tray to 3½-in. pots is found to have a similar retarding effect. The effect of pot size on tomato growth is under examination. Trials show that overhead watering is preferable to dipping in the case of tomatoes and onions in pots and boxes, while lettuce is indifferent. The effect of temperature and soil and of age and root-boundness at time of planting on tomatoes is being investigated. The use of muriate of potash is found to have no bad effects on onion seedlings up to the planting out stage, provided they are grown in a properly balanced compost. Trials to date show that individual tests are necessary with each crop before peat can be recommended as a top dressing. Tests of hoeing *versus* no hoeing show that the only effect is weed removal and at present hoeing is the most economical method of doing so. In experiments on chemical soil sterilization the degree of weed elimination is found to depend on several factors, e.g. the temperature of the soil has an indirect effect which varies with the season.

961. MADRAS, DEPARTMENT OF AGRICULTURE. 633/635
Report on the work of the agricultural stations in the Madras Presidency for 1941-42, 1943, pp. 692.

The reports in which this Bureau is interested are those of the fruit research station at Kodur, the pomological station at Coonoor and the fruit stations at Burliar and Kallar. *Kodur* (pp. 619-30). In the citrus rootstock trials rough lemon (jamberi) had produced the all-round largest *chinee* orange trees 41 months after planting out, with acid lime (*C. aurantifolia*) and gajanimma (*Citrus* sp.) ranking next. Kichili (*Citrus madraspatna*) gave a tree with scion spread equal to rough lemon. Pummelo (*C. paradisi*) and billikichili (*Citrus* sp.) and unworked scion seedlings showed the smallest scion tree measurements. None of the differences were significant when analysed by the co-variance method. Gajanimma is proving susceptible to stem and root diseases. Incidence of canker on lime, as judged by the mean weight of diseased prunings per tree, was 7·9 oz. on acid lime, 9·8 oz. on rough lemon, 12·2 oz. on gajanimma, and 16·3 oz. on unworked seedlings. A trial with chinee orange on size graded rootstocks indicated that grading was not of any practical value; the selection of rough lemon seedlings in the seedbeds on the basis of period of germination or extent of polyembryony was also futile. Chinee orange on *Atalantia monophylla* and *Feronia elephantum* made satisfactory growth, that on *Aegle marmelos* died. Mango. Certain mango varieties gave a very high percentage of take

when pre-cured scions were side-grafted on to 13½-months-old seedling stocks; other varieties were less successful. Double grafting appeared to increase the stem girth. Bangalora mango. With neelum mango as the scion, seedling rootstocks grafted at 16½ months had 37 months later a smaller stem girth than those grafted at 10½ and 13½ months. Height differences were not significant. During the first 27 months of orchard life trees on polyembryonic stocks made more rapid growth than those on monoembryonic stocks. South African papaya, though superior in exterior colour and taste to Indian varieties, will not become popular locally on account of its small fruit, low yield and susceptibility to collar rot. Kodur, however, is not a suitable locality for papaya. *Coonoor* (pp. 593-608). Altitude 5,800 ft. Apple. The collection consists of 704 trees of 40 varieties mostly on unknown rootstocks. Apples do not do particularly well, though the high price of the fruit offsets limited yield. Lists are given of fairly prolific and of poor varieties. Notes are given on the behaviour of Merton and Malling stocks and their susceptibility to woolly aphis. Root grafting gives a very high percentage of success, almost equal to that of stem grafting, nevertheless growth of root-grafted material has been somewhat poor up to the close of the year. Whip grafting might well replace whip and tongue with root grafts as being easier. The success percentages are almost the same. Trials with Malling and Merton stocks are being prepared but the trees grafted in 1939 had not been planted out by the end of the report period, although beginning to bear. The rootstock influence on first cropping is not apparent, but of the three scion varieties Rome Beauty yielded consistently higher on all stocks than Irish Peach, with Winterstein always the lowest. Varietal influence in woolly aphis incidence is shown in a series of tables. Seventeen scion varieties are apparently immune, 16 fairly susceptible and 7 highly so. Plums. Flute budding of plums was as successful as shield budding, 100% success being registered in 3 out of 4 varieties worked. Pears. Quince stock. In the layer beds quinces A and C were more prolific of shoots than *Pyrus pashia*. Jargonelle and Keiffer pears showed some incompatibility with quince stock. *Burliar* (pp. 609-12). The station which has existed since 1871 provides a trial ground for almost all varieties of fruit and plantation crops of the humid tropics. It is, however, on so steep a site and so planted up, and the maintenance staff is at present so small that yield trials are impossible, nor could other observations be made. *Kallar* (pp. 613-8). Budding, grafting and rootstock trials with loose-skinned oranges and mangosteen are in progress, but the results so far have not been very satisfactory for reasons not yet determined. The station (altitude 1,400 ft.) is principally a trial ground for tropical and subtropical fruits. It also sells young plants, the principal demand being for loose-skinned seedling orange. Each report includes an appendix recording details of the station and its objects.

962. MAURITIUS, CHAMBER OF AGRICULTURE. 633/635
Rapport du Président sur l'exercice 1942-43. **(Report of the President for the year 1942/3.)**
Rev. agric. Maurice, 1943, **22**: 212-33.
Reports on the agricultural state of the island with special reference to production, import and exports.

963. PENNSYLVANIA. 633/635
Science for the farmer.
Fifty-sixth Annual Report of the Pennsylvania Agricultural Experiment Station for 1942/43, 1943, pp. 44.
Accounts are given under *Orcharding* of work on varietal difference in susceptibility to frost damage of apple blossom, soil management trials and renovation of soils deteriorated as the result of continued clean cultivation, control of codling moth by nicotine bentonite and control of pistol case-bearer by dinitro and other sprays. *Vegetable* work includes trials of sweet corn hybrids, vegetable varieties, especially lettuce, and irrigation of tomatoes, yellow and green string beans, spinach, beet, carrots and peas. With peas, which are grown during the moist part of the year, only the addition of excess fertilizer enabled irrigated plants to outyield non-irrigated. Control of symphylids in the greenhouse has been effected by nicotine and other compounds.

964. QUEENSLAND ACCLIMATISATION SOCIETY.
634/635: 551.566.1
The Seventy-seventh Report of the Queensland Acclimatisation Society 1942-43, Brisbane, 1943, pp. 5.
Work is now in progress at Redland Bay. The scientific side has had to be curtailed owing to war demands. Notes are given on the custard apple orchard, avocado orchard, mangoes and soya beans.

965. SALISBURY. 634.58+635.65
Annual Report of Experiments at the Salisbury Agricultural Experiment Station, season 1941-42.
Reprinted from *Rhod. agric. J.*, 1943, **40**: 242-52.
Reports made include particulars of trials of groundnuts, soya beans and velvet bean hybrids.

966. SOCIETY OF CHEMICAL INDUSTRY AND THE INSTITUTE OF BREWING (BROWN, B. M.). 663.41
Report on the Fermentation Industries for 1943, 1944, pp. 11, bibl. 96.
In 1943 British brewers, at the request of the Ministry of Food, for the first time substituted unmalted oat flakes for 15% of barley malt in their mash tuns. Absence of adverse comment appears to have justified the action. The increased use of the combine harvester and its adjunct here, the farm dryer, gives rise to danger of damage to the viability of the barley in a wet season. An increase of *Verticillium* wilt of hops in Kent gave cause for anxiety. The progress towards varieties resistant to this disease is slow. Among other research items of cultivation and fermentation touched on is the investigation into the vitamin content of beer. The latest work suggests that a pint of beer contains about one quarter of our daily requirements of riboflavin (vitamin B_2) according to the Food and Drug Administration of the U.S.A. The use of by-products and effluents is also considered.

967. GARNER, R. J. 634.1/2-1.535+1.534
Propagation by cuttings and layers. Recent work and its application, with special reference to pome and stone fruits.
Tech. Commun. Bur. Hort. Plant. Crops **14**, 1944, pp. 79, figs. 8, bibl. 255, 3s. 6d.*
In this review of recent work on methods of vegetative propagation the author not only describes the results achieved by different workers using different methods but also shows clearly how many are the factors which influence success. He gives a clear illustrated account of the technique adopted at the East Malling Research Station and discusses future possibilities.

968.
The following Annual Reports have also been examined:—
3rd A.R. Inst. Agric. Anand, India, for 1942/43, pp. 31.
Rep. Dep. Agric. British Honduras for 1942, pp. 12.
13th A.R. Sugar Cane Res. Stat. Mauritius for 1942, 1943, pp. 28, 50 cents.
NATIONAL RESEARCH COUNCIL OF CANADA, DOMINION DEPARTMENT OF AGRICULTURE, FISHERIES RESEARCH BOARD.
Reports [mimeographed] *of the Canadian Committee on Food Preservation for 1941 and 1942*, Ottawa, 1942 and 1943. [Confidential.]
Sections on fruit and vegetable preservation included.

* Obtainable from I.A.B., Central Sales Branch, Agricultural Research Building, Penglais, Aberystwyth, Wales.